Foundry and Machine-Shop Illumination—*Articles on Public Policy Issues and Other Questions Interesting to Managers and Electrical Engineers*

Electrical World

New York, July 7, 1917 McGraw-Hill Publishing Co., Inc. Vol. 70, No. 1 10c a copy

Engineering Library
JUL 9 1917
UNIV. OF MICH.

Hughes Electric Ranges are well known in the average home because they are nationally advertised in four of America's leading magazines

Hughes Electric Heating Company
Chicago

Masterpieces of Structural Perfection

are the

Weston

MINIATURE PRECISION INSTRUMENTS
For Direct Current

MODEL 267
Switchboard Ammeter

Model 280
Triple Range, Portable Volt-Ammeter

The same degree of mechanical and electrical excellence which has won pre-eminence for the larger Weston Models is embodied in these wonderful little masterpieces of the instrument maker's art. The finest watch is a less striking example of perfection in delicate workmanship. They are accurate, dead-beat, extremely sensitive. They are shielded against external electrical and magnetic influences. Despite their great refinement in workmanship they are very substantially constructed and have the longest scale ever provided in instruments of similar size. In short, they are the finest development of small instruments of the pivoted moving coil, permanent magnet type. And the prices are low.

The group includes Portable Volt-Meters, Milli-voltmeters, Volt-Ammeters, Ammeters, Mil-Ammeters in single, double and triple ranges; Battery Testers; and Switchboard Voltmeters, Volt-Ammeters, Ammeters and Mil-Ammeters. The several models and ranges offer a selection from over 300 different combinations. The switchboard instruments are listed in Bulletin No. 20 and portable instruments in Bulletin 501. These will be mailed on request.

Weston Electrical Instrument Co.

13 Weston Ave., Newark, N. J.

New York	Boston	San Francisco	Cincinnati	Pittsburgh	Montreal
Chicago	St. Louis	Detroit	Buffalo	Winnipeg	Vancouver
Philadelphia	Denver	Cleveland	Richmond	Toronto	London

Electrical World

The consolidation of Electrical World and Engineer and American Electrician.
Published by the McGraw-Hill Publishing Company, Inc.

Vol. 70 NEW YORK, SATURDAY, JULY 7, 1917 No. 1

Destiny of the Engineer

THE presidential address delivered by H. W. Buck before the American Institute of Electrical Engineers last week is reprinted in full in this issue. To it all engineers should turn, for his remarks on the narrowing effect of exclusive specialization are timely and to the point. The rigorous austerity and bigotry of restricted science is as much to be avoided as implicit reliance on the classics and the softening influence of the humanities. Happiness rests with neither. Science in its true sense is not specially concerned with one class of phenomena or with one subject of investigation, but pertains alike to all branches of knowledge. Of what use is an engineer who in specializing gleans and verifies observations, combines experiments, weighs probabilities and discovers facts and partial laws, if his work cannot be turned to account in enlarging the resources of human life and happiness? President Buck pleads for a firm and proud sentiment of duty on the part of the engineer, a genuine public spirit and a noble idea of what an engineer owes to himself. We need in these times more men of the type of Huxley and Tyndall, who, versed in the letter as well as in the spirit of science, changed the popular conception of natural knowledge and became leaders who to this day are recognized, respected, followed with confidence, and who conscious of their responsibilities carried the burden as well as the advantage with dignity. Specialization there should be, for a man like a machine is more powerful for being more special, but the engineer must not permit himself on that account to become only a self-centered piece of mechanism. He should know science, art, language and literature so that his innate nobility may receive a more wholesome and complete development. He should improve his condition, have confidence in his worldly destiny, and widely expand his faculties; having done which he should fulfill his proper function in the community and take his place as a leader and guide of men and of civic affairs. This is the moral we draw from President Buck's address, and we commend its wholesome advice to all engineers.

The Wireless Situation

DESPITE persistent efforts at the repression of unauthorized wireless plants, it is reasonably certain that a good many are still in operation within our borders. The number of those already discovered by the investigations of the United States authorities would probably surprise the public were it disclosed. It is sufficient to say that they have been found adroitly hidden in all sorts of ways. For the most part such concealed plants do not have large sending capacity, but it is possible to relay from one to another over considerable distances and to receive messages from plants outside of United States territory. It is well known that German wireless activities have been in evidence in the countries to the south of us and communication can be made through these via the concealed plants now in existence. We know of no better way in which electrical men can do service to the country than by keeping eyes and ears open for any signs of local activity in wireless.

The government could well organize as part of the Home Guard a large group of experts equipped with detecting apparatus who should make it their business to trace from city to city any dispatches apparently sent from other than the authorized stations. Electric light companies may well make it part of their business to keep watch for suspicious loads upon their lines, and particularly any installations of motor-generators. It is of fundamental importance that news concerning, for instance, the sailing of troops and munition ships should not be allowed to pass without the limits of the United States either by wireless or by any other means which can be prevented. The southern border of our country, from which wireless information might reach Mexico or even clear across the Caribbean, should be watched with particular alertness. It is time to remember that we are at war and that treasonable communications with the enemy ought to connote an open grave and a firing squad.

Analyze Your Rates

INFLEXIBILITY of rates in the face of rising costs is to-day the greatest danger menacing public utilities. Fortunately for electrical properties, their rate-making permits greater flexibility than that of other properties; their efficiency has made greater progress. It is the railroads on which a heavy burden falls by reason of the failure of the Interstate Commerce Commission to let higher costs be met by proportionally higher rates. This commission has missed an opportunity to strengthen the business structure. Every form of commercial activity, whether commodity or service, excepting only that rendered by the utilities, is making prices high enough to meet total costs; most of them are adding a round amount for extra profit. What the railroads will now have to do is to curtail unprofitable service in order to let economies give as much protection as possible to net revenues. The time has passed when appeal to the Interstate Commission will be effectual without a new series of hearings, a new presentation of the blighting effect of ascending costs and descending or

stationary rates. State commissions throughout the country are in closer personal touch with real operating conditions; they know the difficulties of local utility plants and we believe will give relief which the Washington authorities deny to carriers.

Rounding Up Isolated Plants on the Coast

THE number of isolated plants still in existence in the West has been rapidly diminishing year by year, and despite the recruits added to the list from time to time, central station commercial departments are figuring on the day, not far distant, when isolated plants in the larger cities shall be no more. In California cities the central stations have recently had unprecedented success in rounding up the remaining isolated plant business, improving the opportunity which the oil situation there has brought about. About three years ago it was the custom of the isolated plant to contract for fuel oil at 60 to 65 cents per barrel, and on these terms, with the added inducement offered by steam heat, building owners were wont to put in their own generating plants in spite of all the central stations might do. Now these conditions are reversed. Fuel oil is worth $1.50 per barrel and the oil companies are making no contracts; you may have it to-day at the current price and take your chance on what you will pay to-morrow. Under these conditions building managers have become heartily sick of the isolated plant idea, and as fast as their long-term oil contracts expire almost without exception the isolated plant business is being added to the central station load.

Universal Power Supply for England

FROM time to time we have published accounts of some of the big power networks which have here by private enterprise been put in operation over considerable areas. In England the electric power supply committee of the Board of Trade has issued a report calling for a more general and adequate supply of electricity derived from great plants and distributed over wide territory. In addition a government committee is reported as having near completion a scheme for bulk production of electricity for the entire country. The Board of Trade committee also calls for such a comprehensive system, pointing out that as things are the interconnection of existing electric supply stations would be entirely inadequate. The government committee apparently looks toward general government control, dividing the whole country into seven areas with a company formed in each to merge existing plants and furnish whatever new supply may be necessary. It is reported also that some headway is being made in laying out the plan for corporate action. Thus far the project would not seem to contemplate actual government ownership, but rather a recognition of the fact that electric power supply is a natural monopoly, working out the most advantageous results for the public when unified under single control.

Municipal supply undertakings in England have been measurably successful, but whether, considering the very diverse conditions to be met, government ownership would offer reasonable prospect of success on the scale contemplated seems rather doubtful. Government control of power would seem to be a most probable solution of the difficulty. It would be, in fact, somewhat of an improvement over the situation with which some of our own large power networks have to contend—of a widely spread system of supply supervised not by one government body but by the commissions of several states. From a physical standpoint the English situation presents much less difficulty than is normally met here. The distances are shorter there, the density of service is greater, and while water power is almost a negligible quantity, there is admirable opportunity for great steam generating plants situated at the mines' mouth and turning out power almost or quite as cheaply as the average hydroelectric plant in this country, reinforced as it has to be by steam auxiliaries. The recognition by the Board of Trade committee that bulk supply of electric power will be necessary for cheap manufacturing after the war is quite in line with judgment and experience here, and the project as a whole looks sound and sensible.

Workshop Lighting

THE adequate lighting of machine shops and foundries is to-day one of the important branches of artificial illumination. Professor Clewell's paper on this topic is specially important in showing the relations existing between natural and artificial lighting and the frequent necessity of making preparations for the latter in order to secure all-day efficiency. The foundation of his investigation is the measure of working illumination in terms of the "daylight factor." This daylight factor—that is, the ratio of the inside to the outside illumination—impresses one at first thought as somewhat indefinite, yet it is the best measure which we have of the practical efficiency of the lighting arrangements in a given shop. Outside, in full daylight, the illumination may be of the order of one or several thousand foot-candles according to the day, the hour and the time of year. Within the building there is comparative darkness, perhaps 20 to 50 foot-candles in very favorable locations, a tenth of this or less in the darker parts of the shop. The daylight factor is merely the ratio of the average illumination inside to what it would be if walls and roof could be deftly lifted off. The measurement of this factor, involving as it does the averaging of interior conditions, is a somewhat laborious matter. Possibly it could be considerably facilitated by the use of an actinometric method; but however measured it does express the broad facts, and the startling thing about it is the very small value of the factor usually found, very rarely 10 per cent, not infrequently down to 1 per cent or even a tenth of this small quantity. In other words, in full daylight one may easily have only one or two foot-candles at certain points within the building. Hence it happens that

on dark and cloudy days and during the weak light of winter one may often have within a workshop far less light than is necessary for efficient operation.

Now, it seems to be a well-established fact that with modern gas-filled lamps well arranged, particularly where off-peak rates can be obtained, the cost of artificial light is less than the overhead on extra space required to increase output, so that in more cases than one would at first suppose artificial light may be economical where only a day shift is in operation. Professor Clewell, starting from this basis, shows the application of modern lighting units—both the gas-filled lamps and mercury arcs—to shop and foundry lighting, with numerical data on the results obtained. A fairly strong and well-distributed light can be secured at a very moderate expense. The intensities which seem to be necessary generally are from 2 to 4 foot-candles, with for special purposes excursions to considerably higher figures. The method most effective is general overhead illumination giving the nearest approximation to the distribution of light obtained by day.

The most difficult practical problem is that which often arises in the case of large working spaces of which portions are inadequately lighted. The mixture of daylight and artificial light is not altogether agreeable, and perhaps only for psychological reasons there is often a feeling that the artificial light is inadequate when it is really quite as strong as that previously obtained by day. The contrast between light near the windows and light within the interior of a shop lighted only from the sides is of course striking. Shops with monitor roofs and plenty of light from above fare better, but the general indication is that an artificial lighting equipment powerful enough to give a night shift opportunity to work to its highest efficiency is an extremely good investment.

Progress Toward Metric System

THE world war is making many and rapid changes. Old landmarks and established modes of thought are disappearing. In the general agitation the effete tends to be supplanted by the efficient. The archaic makes way for the modern, under the pressure of necessity, when the modern has proved its worth. The good old system of pounds, shillings and pence is joining hands in Great Britain with the ripe old system of bushels, acres and inches to bid the world farewell. So many hundreds of thousands of young Englishmen have gone to somewhere in France that Englishmen have seen a great light in the simple workings of the decimal and metric systems. They are urging the abolition of needless and brain-wasting multiplication of units at home.

The annual report of the Decimal Association in London begins by reciting a list of twenty-eight public bodies in the United Kingdom that have recently advocated the decimalization of coinage weights and measures. One of these bodies acts as representative of 367 county and town councils throughout the kingdom. In addition, the Association of Chambers of Commerce of the United Kingdom last March passed resolutions calling for parliamentary legislation to decimalize the currency and also to metricize weights and measures. Similar resolutions have been recorded recently by the Court of Common Council of the city of London, the County Councils Association, the Incorporated Association of Head Masters and the Institution of Electrical Engineers.

Powdered Coal as a Fuel

THE possibilities of burning coal so finely pulverized as to be treated under the boilers almost like an oil spray improve with rise in the price of fuel. Methods which are unavailable in competition with ordinary cheap coal may be extremely valuable at the prices now existing and impending. The main point in working powdered coal successfully seems to be keeping it from moisture and air as effectively as possible until it is actually burned. It is particularly sensitive to moisture and must be dry to feed readily. Perhaps the practical difficulty of keeping up the supply of fresh dry coal dust is the most serious one in the whole matter.

In one case recently recorded in our columns the coal used was really a lignite with very high volatile contents. The boiler was equipped with an extended oven to give space for proper combustion, and into this furnace the fuel was blown by motor-driven fans. The thermal value of the coal was 11,760 B.t.u., and the evaporation from and at 212 deg. was 8.6, pushing the boiler efficiency to 71 per cent and showing very satisfactory results. Dust-fed furnaces seem to give the same facility in forcing the load as would be found in the use of fuel oil.

The Coming Issues

WHERE producer gas or any other gas suitable for burning in furnaces is readily available central station companies may find it economical to increase the ratings of their boilers by burning gas in conjunction with coal. The results of an investigation made by one company before adopting the practice will be presented in the next issue of the ELECTRICAL WORLD. Other fuel problems will also be discussed. The seventh installment of Professor Clewell's series on lighting will contain a discussion regarding the illumination requirements of office spaces and the relative advantages of direct, semi-indirect and indirect lighting systems. The shortcomings of existing equipment for outdoor switching and transformer stations will be taken up in the July 21 issue in connection with suggestions that should relieve the situation considerably. The final issue in July will present the results of an investigation into the practices of central station properties regarding the sale of appliances and energy to employees. Considerable data have been gathered which will be analyzed so that the majority practices may be revealed. Other articles of particular interest to central station executives will appear.

Position of the Engineer in National Affairs*

Commanding Influence and General Recognition of Men of Scientific Training in the World of To-day—Interdependence of All Branches of Engineering and Drawbacks of Overspecialization

BY H. W. BUCK
President American Institute of Electrical Engineers

THERE has been much discussion concerning the position of the engineer in modern times, but conditions are changing so rapidly and points of view are undergoing such a fundamental evolution that it is well from time to time to review the relations of the engineer to his surroundings and to secure if possible the proper orientation.

The Accomplishments of the Engineer

The change and improvement in the engineer's position in the world in recent years have been so rapid as to surprise even those who were the optimists in the under-dog days of the engineering profession. In the middle of the last century, when the engineering and technical schools began to be formed in this country by men of far-seeing vision, the classical scholars looked on askance and took pains to differentiate these upstart institutions from their own traditional schools of learning and to ostracize those who pursued the new courses by classifying the professions as "learned" and technical.

Times fortunately have changed. The engineering profession is coming into its own. To-day the engineer is being swept along by a tide which he himself has created with an irresistible force, and it is well therefore for the engineer to take his eyes off his work occasionally and to observe his constantly changing surroundings. A flood of scientific and technical accomplishment has swept over the face of the earth, revolutionizing life, commerce and international destinies. Even the turmoil in which the world now finds itself can probably in the last analysis be traced to the over-acceleration of world affairs resulting from the work of the scientist and engineer.

In all this development period of the engineering profession during the last century the engineer has worked his way along alone and in silence, so to speak, seeking his reward rather in the joy of accomplishment and in the realization of his dreams than in worldly recognition and accumulation. The very inherent greatness of the pioneers who have laid the foundations upon which we now build prevented them in a way from acquiring a more worldly position in affairs. This tradition, however, is not a virtue beyond a certain point, and the engineer by nature is too willing to give way to others. The time has come when he should take a more worldly position in the world which he himself has created.

In our general relations to intellectual development we may consider that we are just emerging from a classical period where tradition, custom, prejudice, ignorance and dogmatic religion were the controlling forces. Movements which took place in world affairs were largely political, following the paths best suited to the advantage of the ruling classes. There was little real progress, because there was no development of scientific knowledge and its application in engineering. Scientific truth held no standing. The worship of tradition caused a powerful reaction against any scientific discovery which might necessitate a readjustment of established habits of thought and life.

For centuries before the dawn of the scientific and engineering era great changes took place throughout the world, but little real progress occurred. Races rose and fell, always falling back to the starting point, for there can be no upward trend in racial development without the solid basis of scientific knowledge to grow upon. China made great progress and developed its early civilization under scientific activity, but during recent centuries it has lived under the worship of classical tradition and has become inert.

A constant change in point of view, which is so largely brought about through developments in scientific knowledge, seems to be necessary for progress in civilization. Our civilization to-day differs from that of a century ago in proportion to the scientific and engineering evolution which has taken place during the period through its reactions on life in all of its phases. Such discoveries in science as the law of gravitation, the evolution of species, the laws of electromagnetic induction, etc., have probably had a more profound effect upon the development of the human race than any other acts in history.

The Engineer in Human Affairs

The engineering profession has passed through the preliminary stages of its growth and has reached a position where the engineer should work and act not only with proper attention to his work itself but with full consciousness of the important relation of his work to human affairs in general. Among the early pioneers in engineering were many notable instances of men of great breadth of view—men like Watt, Fulton, Whitney, McCormick, Erickson and others. Specialization had not at that time begun to work its narrowing influences. Of recent years, however, under the stress of commercial development and economic conditions, increasing specialization has taken place and the engineer has become obliged to compass his mind with an ever-narrowing horizon. This specialization produces extraordinary proficiency in particular fields, but has the objectionable effect of narrowing the character and outlook of the man and of reducing his value as a citizen. We must take care lest commercial considerations and the modern mania for efficiency in the narrow sense force our engineers to lose sight of the world around them in their concentrated attention to the part rather than to the whole. This excessive specialization is a danger which threatens the future standing of the engineer.

*Address at special meeting of American Institute of Electrical Engineers, New York City, June 27, 1917.

It is interesting to recall in this connection the results of a recent canvass made by a joint committee on education on the qualities which, in the opinion of about 5000 leading men, engineers and others, best fit a man for a successful career as an engineer. As a result of this vote only thirteen points out of a hundred were assigned to purely technical knowledge as an essential, the other eighty-seven points being allotted to broader qualifications, such as judgment, character, human understanding, etc. This is merely a quantitative statement of the many general demands now being made of the engineer, and it illustrates how his work has broadened out. It is an interesting and encouraging symptom.

A most significant movement of recent times in the engineering world has been the development of co-operative action among engineers of all classes, and this tendency will, I believe, serve to offset the evils of specialization. It is the growing recognition of the fact that all branches of engineering are interdependent. We electrical engineers, I believe, are well aware how much we need the assistance of other branches of engineering for the successful fulfillment of our purpose.

THE ENGINEERING COUNCIL

This co-operative movement has quite recently been given tangible expression in the formation of the Engineering Council, an act, I believe, of far-reaching consequence. Under this organization as a beginning the Civil, Mechanical, Mining and Electrical societies, together with the United Engineering Society, are tied together for co-operative action through a joint body of twenty-four representatives. This body will meet at frequent intervals and will deliberate on matters of general interest to engineers. It is an encouraging beginning toward universal co-operation among engineers in all branches of work.

In this Engineering Council we have for the first time an engineering body representing about 30,000 engineers of sufficient scope and standing to create an engineering public opinion. Its influence is likely to be far-reaching in building up the prestige of engineers in both technical and civic affairs. A further development which has reached full recognition only in recent times is the mutual appreciation which has grown up between the engineer on the one hand and the worker in pure science on the other.

The engineer looks to the scientist to provide him with raw materials of knowledge with which to work out his applications, and the scientist must look to the engineer to make his discoveries so fruitful that the full effectiveness of his work on the frontier of research can be sustained. Both are working together in order to unfold nature in the most effective way for the benefit of man.

We electrical engineers, I think, feel a particularly close bond with the pure scientist in that recent developments in physical science have disclosed an intimate relationship between electrical phenomena and the nature of energy and matter.

All of the important movements taking place at the present time which center around the engineer and his work mean, I believe, that the engineer is soon going to leave his position of isolation in independent fields of work and realize that he owes an obligation to the community broader than his daily engineering work and will contribute to the general welfare his talents and experience. It matters not whether the problems before him are political, sociological, industrial or technical, I believe that the engineering type of mind, if the proper breadth of view has been acquired, is best fitted to undertake them.

RESOURCEFULNESS AND IMAGINATION OF THE ENGINEER

It is not necessary, perhaps, in important administrative positions to have civil, electrical or mechanical engineers as such, but we do need men in those positions who have had training of the type which engineering gives, with the mental balance, the power of analysis which such a training develops, the resourcefulness and the faculty of recognizing and properly apportioning the various elements in a problem. There is a quality of mental honesty which engineering experience highly develops which is sorely needed in public life. The scientific and engineering professions should rise up and furnish such men from their ranks for the welfare of the country.

The classicist contends that a world dominated by scientists and engineers would be cold, materialistic and atheistic, and lacking in those qualities of art and sentiment and the imaginative outlook which every civilization so highly prizes. To this doctrine and its injustice to the engineer I want to take emphatic exception. The world to-day may be inclined toward materialism, but it is not dominated by the engineer—far from it—but by other classes.

The engineering mind, on the other hand, numbers among its characteristics a highly developed creative imagination and possesses to a high degree exactly those qualities of mind and temperament best suited to combat materialism. There have been many instances in history of great artists who have been great engineers and vice versa, and I believe that the two temperaments lie in close relationship. Furthermore, scientists and engineers as a class have a strongly developed spirit of international understanding and sympathy which may serve as an important safeguard against excessive nationalism and excessive aggression as well.

DESTINY OF THE ENGINEER

And so, gentlemen, I believe that we can confidently look forward to a new era for the proper fulfillment of the destinies of the engineer. Out of this world chaos we now see men of engineering and scientific training rising to positions of commanding prominence on all sides. It is simply the working of the inevitable law of the survival of the fittest.

In this great movement not only must the individual engineer play his part, but the great engineering societies must realize the power of influence which they are developing in an ever-increasing degree in the community at large and the obligations which devolve upon them.

And so I hope that the American Institute of Electrical Engineers as it passes along from one administration to another will acquire an increasing realization of its duty, not only in furthering the growth of science and engineering, but in furthering the influence of the engineer in the affairs of the country and of the world.

Foundry and Machine Shop Lighting

Relation of Daylight Factor to Artificial Illumination Requirements, Value of Uniformly Distributed Overhead Lamps, Results Obtained in Actual Practice, and Recommended Illumination Intensities

BY C. E. CLEWELL

Assistant Professor of Electrical Engineering, University of Pennsylvania

SUMMARY.—This article treats of one of the most important divisions of the industrial lighting field. The daylight factor of buildings is defined and discussed in order to show the importance of artificial light even in those plants which normally limit their work to daylight hours. Emphasis is also placed upon the present attitude toward the use of overhead lamps of sizes adapted to the mounted height required in machine shops and foundries. Differences in the distribution of illumination from one large lamp and a number of smaller lamps, for the same area, are made the basis for showing the superiority of moderate-size units over very large lamps for many shop installations. The peculiar difficulties in lighting foundries are discussed and methods explained for obtaining a sufficient degree of illumination on working surfaces other than those on a horizontal plane. To illustrate the requirements in a shop, reference is made to representative working spaces including assembly rooms, flat bench work and other operations which require considerable light from the side. The limitations imposed by very high and very low shop bays are touched upon. Special attention is directed to the excellent list of photographic views included in this article.

THE requirement of a factory building for artificial light during daylight hours can perhaps be best understood after a study of the efficiency of window lighting. In other words, the proportion, daylight factor[1], of the light incident on the outside of the buildings that reaches the work inside should be observed. The measurement of the outside illumination corresponding to an inside measurement should be equivalent to measuring the illumination at the inside point but with walls and roof removed. Tests show that this factor for some roof-lighted buildings is on the order of 2 per cent. Near the center of some workrooms where dependence is placed on lateral windows this factor falls as low as 0.01 per cent. In other words, the illumination in the last-mentioned position is only one ten-thousandth of the value which would obtain if the walls and roof were removed.

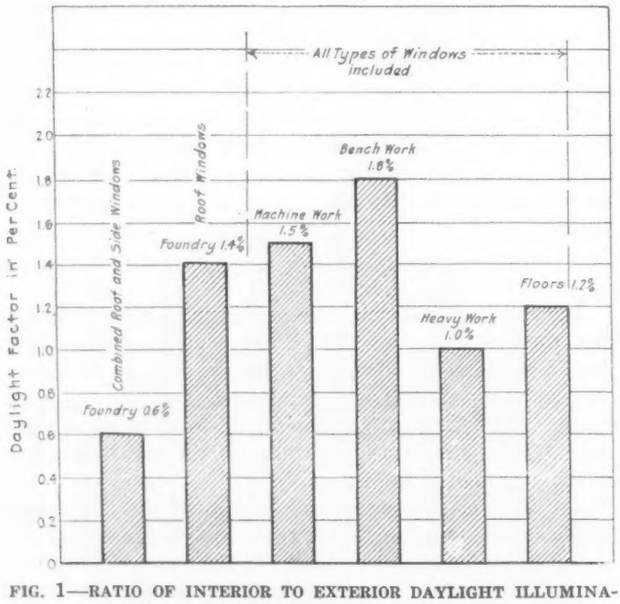


FIG. 1—RATIO OF INTERIOR TO EXTERIOR DAYLIGHT ILLUMINATION FOR VARIOUS TYPES OF BUILDINGS

TABLE I—LIGHTING DATA RELATING TO FOUNDRIES USING MERCURY-VAPOR LAMPS*

Number	Total Square Feet	Watts per Lamp	Watts per Square Foot	Height Above Floor in Feet
1	15,200	725	0.52	22
2	12,400	725	0.23	27
3	24,000	725	0.24	45
4	28,180	725	0.34	22
5	5,000	725	0.29	42
6	44,000	400	0.20	27
7	44,500	400	0.55	12
8	16,300	400	0.30	20
9	30,800	400	0.31	23–35
10	6,900	400	0.31	15
11	13,400	400	0.28	16
12	90,500	400	0.34	18
13	12,000	400	0.26	18
14	28,350	200–400	0.29	18

*Reported in *Transactions* I. E. S., annual convention, September, 1915, by W. A. D. Evans.

Relation of Daylight Factor to Artificial Lighting Requirements

Within limits the daylight factor for any specific installation is constant[2] whatever the time of year or the nature of the external conditions. Thus it is an important basis for the study of artificial-light requirements during the day shift. If this factor be known for any point in a shop, it is possible to determine the value of the outside illumination necessary for producing a minimum illumination at this point. Hence if the outside illumination in certain parts of the winter months or on dark cloudy days of the summer falls below this quantity, it follows that, if this minimum inside value of the illumination is essential at all times, the addition of an artificial lighting system is imperative. Of course, this statement should be modified if there is any way in which to increase the efficiency of the window lighting—by changes in the building construction to provide more window area, by the use of some form of prisms for directing the daylight more effectively into the buildings, or possibly by more frequent window cleaning.

The proportion of outside light which reaches a point on the inside of the factory building has been shown in the British report previously quoted seldom to reach as much as 10 per cent. More often it is 1 per cent or one-tenth of 1 per cent, which indicates that the outside illumination may easily reach values a thousand or even more times the inside values at the work. On a

[1]The "daylight factor" is defined as the ratio of the inside to the outside measurement of illumination at a given time of day, expressed as a percentage.

[2]First report of the departmental committee on lighting in factories and workshops under governmental appointment in Great Britain and issued in 1915. Reference is made in these notes to pages 38 and 63 of this report.

bright summer day, when the outside intensity amounts to say 5000 ft.-candles, work will be possible on the inside of the building with a daylight factor of one-tenth of 1 per cent, that is to say, when the intensity is thus 5 ft.-candles. The British tests show, however, that on an average December day the outside intensity does not exceed 750 ft.-candles even at noon. Hence in a building with a daylight factor of one-tenth of 1 per cent at certain parts the inside intensity will be less than 0.75 ft.-candle during practically all daylight hours of the winter. While this case may be somewhat extreme, it illustrates forcibly the point involved, and the values of this factor (Fig. 1) for various buildings may be studied with profit in connection with the average exterior daylight intensities throughout the year.

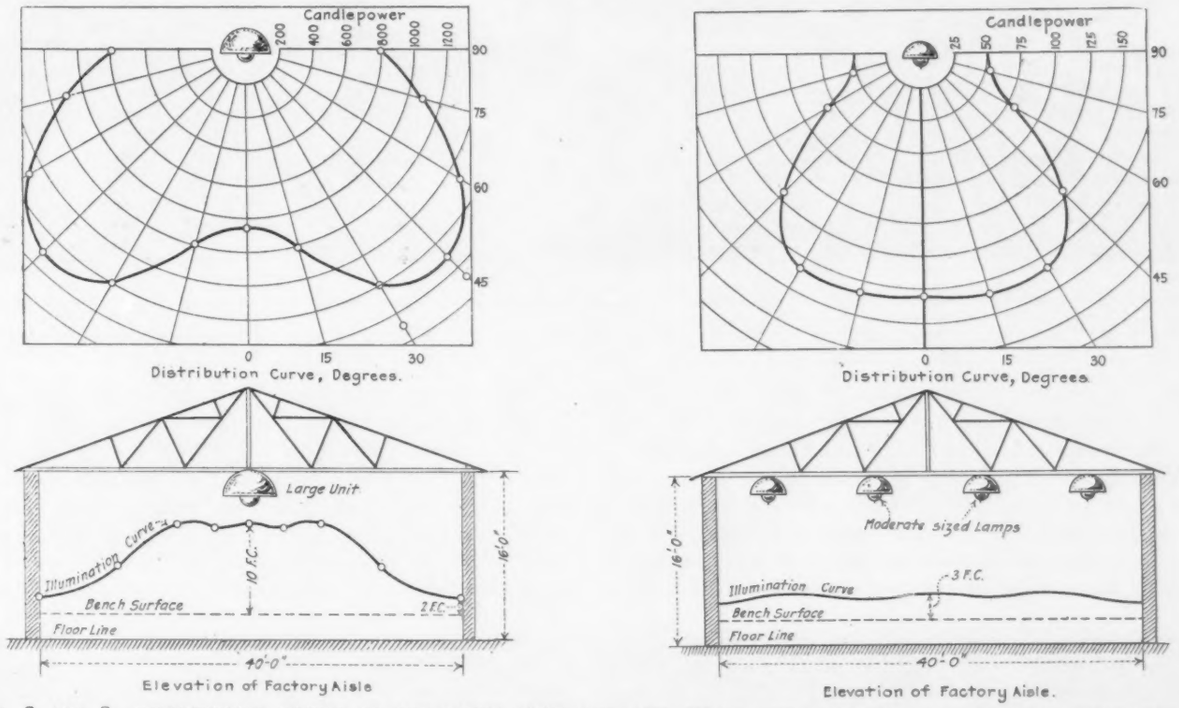
RECENT TESTS IN THIS COUNTRY

Recent tests[3] in factories in this country show that even when the daylight intensities near windows amount to several hundred foot-candles the corresponding intensities at actual points of work range from 1 ft.-candle to 20 ft.-candles, the average of the minimum values being 4 ft.-candles and that of the maximum being 18 ft.-candles. Obviously on dark cloudy days and at many times during the winter these intensities may fall much below the values required for effective workmanship.

It has also been shown by Ward Harrison that the cost of artificial light during off-peak hours with modern lamps is less than the rent or fixed charges on additional factory space and equipment which a plant may find necessary to enlarge its output. These facts demonstrate therefore that artificial light will usually be required where a day shift only is employed. Furthermore, the presence of an adequate lighting system adds to the value of the plant by making it possible to use it for manufacturing purposes during the entire twenty-four-hour period of each day in cases where increased orders make it essential to add a night shift. This procedure will probably be more economical than to attempt to employ day shifts only and to enlarge the actual floor space devoted to manufacture.

PRESENT ATTITUDE TOWARD OVERHEAD LIGHTING

The reasons why the overhead system and moderate-size lamps have received such general approval for machine-shop and foundry illumination are demonstrated in a fundamental way in Figs. 2 and 3. The intensity of the illumination obtained on bench surfaces with one large lamp having a distribution of candle-power curve as indicated at the upper portion of diagram is shown. This single large unit might be an arc lamp, for example, with a first cost so high as to make it necessary to install the lamps far apart. The excessive intensity at points under the lamp and the inadequate values at the ends of the benches should be noted. In contrast Fig. 3 indicates the results obtained by the substitution of smaller uniformly distributed lamps. The much superior distribution of the light on the bench surfaces is apparent from the approximate illumination curve shown in the diagram.



FIGS. 2 AND 3—DISTRIBUTION CURVES OF ONE LARGE LAMP AND ONE SMALL ONE, SHOWING ILLUMINATION INTENSITY ON HORIZONTAL PLANE THROUGH BENCH SURFACES

Day and night views at the McCormick works of the International Harvester Company are shown in Figs. 4 and 5. The installation in this foundry is particularly interesting, consisting of 300-watt nitrogen-filled tungsten-filament lamps housed in Benjamin steel socket-reflector units. The building is about 1400 ft. (426.7 m.) long by 70 ft. (21.3 m.) wide, thus representing an unusually large working space. The lamps are mounted about 18 ft. (5.4 m.) above the floor.[4]

[3]Article by J. R. Cravath, discussing tests by Ward Harrison and associates. ELECTRICAL WORLD, Vol. 69, No. 22, page 1077.

[4]Figs. 4 and 5 are shown by courtesy of O. L. Johnson of the Benjamin Electric Manufacturing Company.

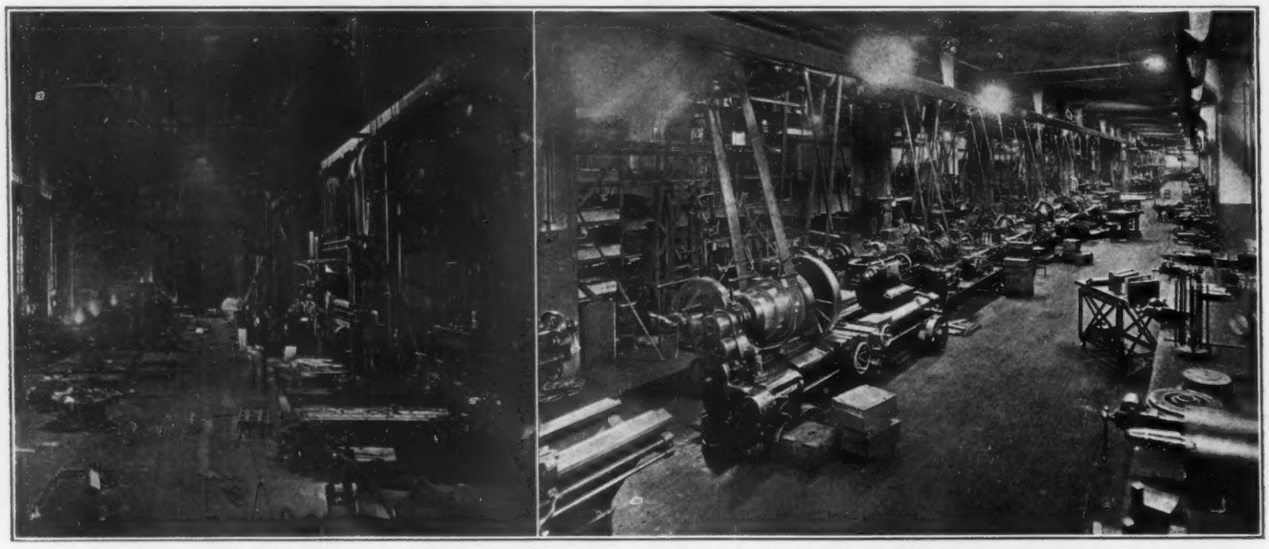
Dark surfaces and an atmosphere often filled with steam make such spaces rather more difficult to illuminate properly than the average machine shop. It is especially important to mount the lamps well overhead and to use reflectors for reducing glare. The lamps should be close enough together to produce sufficient light for the worst atmospheric conditions that are likely to occur during the average working day, and the lamps and reflectors should be cleaned frequently.

The nature of foundry work usually makes it very important to have high-intensity side and other directional-component illumination besides an adequate intensity on horizontal surfaces only. It does not follow that the most effective lighting system as measured by a photometer on a horizontal plane will result in a sufficient intensity for side surfaces in the molds. To increase these side components, it may be necessary to employ reflectors giving a broader distribution of light than those which produce merely uniform illumination directly beneath. A similar result may sometimes be secured by lowering the lamps somewhat, although this practice is undesirable if glare is produced. Light-colored walls and columns also help produce the desired effect.

A night view of a forge shop in the Stearns foundry at New Orleans, La., where 1000-watt nitrogen-filled tungsten-filament lamps are used in conjunction with X-Ray "Jumbo" reflectors[5], is shown in Fig. 6. This view is typical of a smaller foundry than that shown by Figs. 4 and 5, the building here being 310 ft. long by 50 ft. wide (94.4 m. by 15.2 m.), with a distance of 42 ft. (12.8 m.) between the floor and the lower cord of the roof trusses. The lamps are suspended directly from the trusses and are above the traveling crane. About 0.25 watt per square foot is required. Although this value is rather low, the illumination is sufficient.

FIGS. 4 AND 5—DAY AND NIGHT VIEWS OF FOUNDRY AT THE M'CORMICK WORKS OF THE INTERNATIONAL HARVESTER COMPANY

The foundry is illuminated by 300-watt nitrogen - filled tungsten - filament lamps equipped with reflectors. The lamps in the central aisle are placed 20 ft. apart and are mounted at a height of 18 ft. above the floor illuminated.



FIGS. 6 AND 7—NIGHT VIEWS IN THE FORGE SHOP AND MACHINE SHOP OF THE STEARNS FOUNDRY, NEW ORLEANS, AND DODGE BROTHERS' PLANT, DETROIT

The Stearns plant is illuminated by 1000-watt nitrogen - filled tungsten - filament lamps equipped with reflectors requiring about 0.25 watt per square foot. The Dodge plant is illuminated by mercury-vapor lamps arranged in two rows 20 ft. apart and 12 ft. above the floor. About 1.5 watts per square foot is required for illumination purposes.

[5]Figs. 6 and 9 are due to J. L. Stair of the National X-Ray Reflector Company, who has also furnished the installation data.

Mercury-vapor lamps are also widely used for foundry purposes. Because of the absence of illustrations relating primarily to the use of this type of lamp in the foundry, Table I is included to show typical data.

An excellent illustration of the effect produced by mercury-vapor lamps in a typical shop is shown in Fig. 7, this view relating to a portion of the Dodge Brothers plant at Detroit where lathe work is performed. The lamps are of the "F" type and are arranged in rows 20 ft. (6 m.) apart, the units being 12 ft. (3.6 m.) above the floor. About 1.5 watts per square foot is required. The complete absence of drop lamps and the fact that the work on the benches receives adequate light from overhead lamps[6] should be noted.

It should be remembered that the machine-tool work illustrated in this view often calls for a strong side component of the light, which in this case is aided by the low mounting height of the lamps and by the light-colored surroundings. The work on the benches may be flat, so a high intensity of vertically downward light is chiefly required. However, work in a vise, for example, as well as other bench operations, and also various operations in assembly work, will often require a high side component, which may be obtained as previously outlined.

Where the ceiling clearance is very low, say 8 ft. or 10 ft. (2.4 m. or 3 m.), small or moderate-size lamps—60-watt or 100-watt tungsten lamps, for example—should be used if uniform illumination and absence of glare are to be expected. With very high bays, where the building construction and the presence of an overhead crane make it necessary to mount the lamps very high, larger units may be used to advantage (Fig. 6).

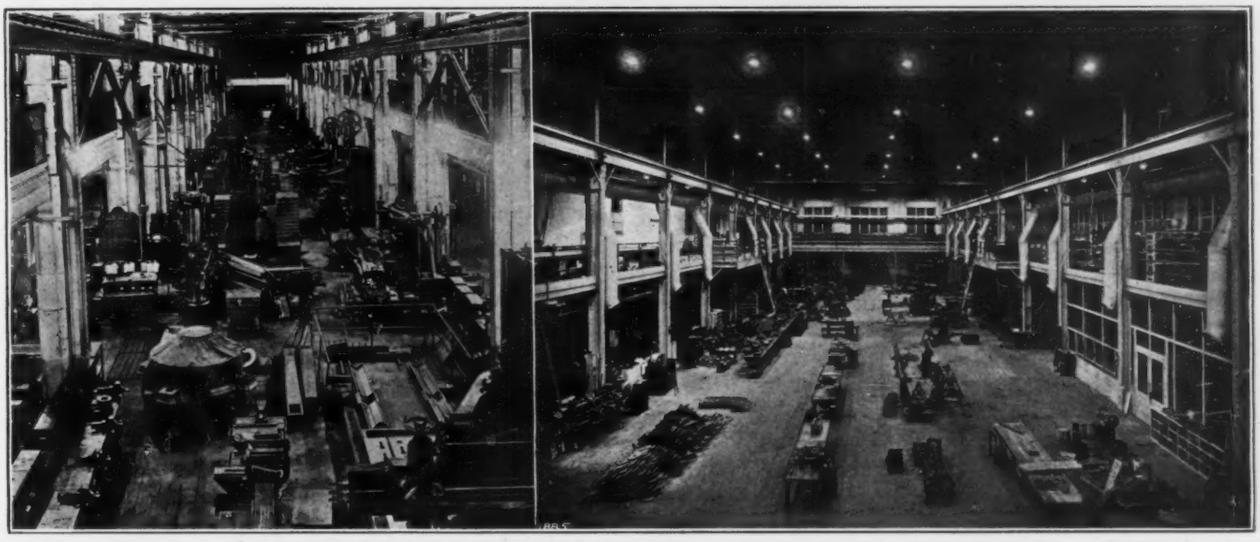
In Fig. 8 a high crane runway is shown in one of the machine shops of the Ford Motor Car Company. Here it has been possible to arrange the lamps on the sides of the aisle, 15 ft. (4.5 m.) above the floor. The use of angle reflectors directs the light effectively to the center of the aisle. This crane runway is 600 ft. (182.8 m.) long by 24 ft. (7.3 m.) wide, and is lighted entirely by mercury-vapor lamps. The work consists mostly of large machine tools used in tool-making processes. Smaller work is conducted in the side bays. In this installation each lamp illuminates about 480 sq. ft. (43.2 sq. m.), about 0.8 watt per square foot being required.

An excellent example of the use of tungsten lamps for large shop spaces is shown in Fig. 9. This view refers to the main shop of the Pyle-National Company of Chicago, manufacturer of locomotive headlights. The central aisle of this building is 60 ft. (18.2 m.) wide by 35 ft. 9 in. (10.8 m.) high to the roof trusses. Each bay is 20 ft. (6 m.) deep. The side bays are 30 ft. wide by 13 ft. high (9.1 m. by 3.9 m.) on lower floor and 14 ft. high (4.2 m.) on second floor. Each central bay has four 200-watt nitrogen-filled tungsten-filament lamps with X-ray No. 575 reflectors. The side bays are each equipped with two 100-watt gas-filled lamps and X-ray No. 570 reflectors.

TABLE II—INTENSITIES COMMONLY RECOMMENDED FOR FOUNDRY AND SHOP WORK*

	Ft.-candles
FORGE AND BLACKSMITHING	
Ordinary anvil work	2.0 — 4.0
Machine forging	2.0 — 3.0
Tempering	2.0 — 4.0
Tool forging	3.0 — 5.0
FOUNDRY	
Bench molding	1.0 — 3.0
Floor molding	1.0 — 2.0
MACHINE SHOPS	
Assembling	4.0 — 7.0
Drills	2.0 — 4.0
Millers	3.0 — 6.0
Planers	3.0 — 5.0
Rough manufacturing	1.25— 3.0
Fine manufacturing	3.5 — 6.0
Special cases of fine work	10.0 —15.0
STOCK ROOMS	
Rough materials	1.0 — 3.0
Fine materials	2.0 — 4.0
Ordinary storage	0.25— 0.5

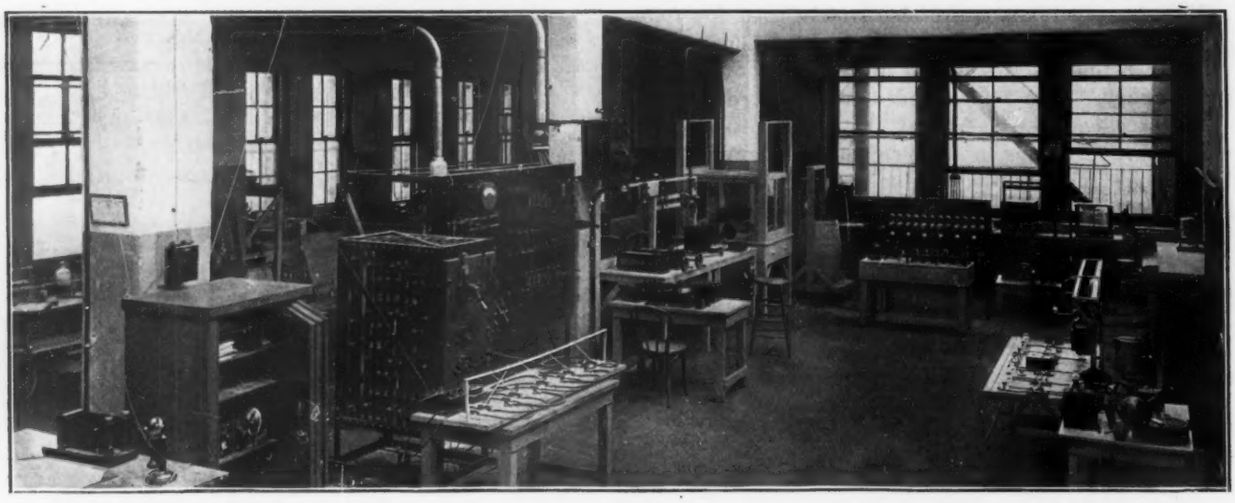
*Given in the author's lecture on factory lighting before the University of Pennsylvania, I. E. S. lecture course, September, 1916.



FIGS. 8 AND 9—NIGHT VIEWS IN PLANTS OF THE FORD MOTOR CAR COMPANY AND PYLE-NATIONAL COMPANY

In the craneway of the Ford company are mercury-vapor lamps mounted 15 ft. above the floors; about 0.8 watt per square foot is required. Tungsten lamps equipped with rippled-glass reflectors are used in the Pyle company's shops.

[6]Figs. 7 and 8 and the data and notes on these installations are included through the courtesy of W. A. D. Evans of the Cooper Hewitt Electric Company.



Underwriters' Laboratories' New Testing Station

Features of New Laboratory at City Hall Place, New York City —Some Unusual Facilities and Novel Apparatus —Importance of Electrical Department

BY EDGAR P. SLACK
Assistant Electrical Engineer, Underwriters' Laboratories

THE Underwriters' Laboratories are an institution established for service—not profit—which examines and tests devices affecting fire hazard and accident prevention, these investigations resulting in recommendations to insurance organizations. The main office and testing station occupy an extensive plant in Chicago, equipped for tests under service conditions on numerous materials and devices. By many electrical men the Laboratories are regarded as dealing only with electrical appliances. This is not unnatural, since at the start, over sixteen years ago, only electrical tests were made, and in fact the early name of the organization was the Underwriters' Electrical Bureau. From this small beginning, however, the work has broadened rapidly to include sprinklers, fire doors, extinguishers, gasoline engines and the like, and a recently established casualty department investigates safety appliances such as machinery guards, goggles and elevator locks, in cooperation with the Workmen's Compensation Service Bureau.

The electrical department, while neither the only nor the largest department of the Laboratories, is of importance both because of the great bulk of electrical production and because of the close scrutiny of electrical hazards by inspection departments. The work of the department covers electrical appliances of all sorts for connection to lighting and power circuits. Originally this work, like the other engineering work of the Laboratories, was done at the principal testing station in Chicago. Five years ago, however, a laboratory was opened in New York, prompted by the large production of electrical appliances in the East.

The New York testing station is an equivalent of the Laboratories' electrical department in Chicago, devices being similarly tested and reported on when submitted in either place. Until the present time the New York office had been on William Street and the testing station on Vandam Street, in a substation building of a large public service company. This arrangement, although advantageous in the nearness of the substation, the facilities of which were frequently extended to the Laboratories, had a drawback in the separation of the testing station from the office. To provide increased efficiency and more space a new location was chosen combining the office and testing station.

The New Laboratory

The new quarters are near Brooklyn Bridge, at 25 City Hall Place, on the top floor of the Evening Mail Building. This is a fireproof building of twelve stories, the *Evening Mail* occupying six and the rest being used largely for printing and light manufacturing. The building is 60 ft. wide by 100 ft. long (18.2 m. by 30.4 m.), with windows on all sides and a roof skylight about 18 ft. by 50 ft. (5.4 m. by 15.2 m.). Part of the floor is reserved for office purposes, leaving a rectangular room of about 2400 sq. ft. (222.8 sq. m.) for the testing station.

In arranging the laboratory equipment the sources of power were placed centrally within easy reach of the entire room, and the test apparatus was grouped around the outside. The apparatus is designed mostly as separate units on wheel bases, which can be moved to the best position for test. This laboratory, where tests are made on widely varying devices and frequently under extreme conditions—with which the Underwriters are chiefly concerned—requires large and varied power supply, ample facilities for power absorption and a large variety of unusual equipment for special tests.

The main power supply is from a 120-240-volt Edison three-wire direct-current power line of 450-amp. rating, running to a switchboard at the center of the room. The switchboard carries switches and cut-outs of graded sizes, to any of which the device under test may be con-

nected. For testing alternating-current appliances a single-phase, 60-cycle line is provided. This is a 25-kva. circuit entering the building at 2750 volts and transformed at the service to a 110-220-volt three-wire line running to a second panel beside the direct-current switchboard. This panel also is arranged with graded switches and cut-outs for the direct connection of the device to be tested.

Besides the two incoming lines a motor-generator set is provided, comprising three machines, a 15-hp., 220-volt direct-current motor at the middle driving a plating generator at one end and an alternator at the other. The plater has two commutators for connection either in series or multiple and can deliver 600 amp. at 12 volts or 1200 amp. at 6 volts. This machine is used for tests requiring heavy currents, and can also be thrown in series with the incoming direct-current line to boost the voltage to full 125 volts or 250 volts when desired. The alternator is a 10-kva., 60-cycle, 250-volt machine which serves as an independent supply for test purposes and also excites a 16,000-volt transformer used for high-potential tests. These machines are operated from a control table carrying all switches and control rheostats. The motor has an automatic starter controlled by a push-button, thus enabling the operator to shut off the power instantly without moving from his position. The plater current is adjusted by varying the excitation, coarse and fine field resistances being provided for this purpose. The alternator, too, has coarse and fine field adjustment, used in raising the voltage of the transformer for high-potential tests.

Recently a 1-kva. sign-lighting transformer has been purchased for providing alternating currents up to 100 amp. at 11-22 volts. This source is more economical than the motor-generator set and is used for rating tests on small fuses and for similar heating tests.

LOADS AND RESISTANCES

On account of the widely varying capacities of the devices to be tested a number of different loads have been provided. For most wiring devices a lamp bank is used, containing about 100 carbon lamps, divided into two sections on a three-wire supply and controlled from a specially wired panel. The arrangement is such that after making tests at 250 volts throwing a single switch automatically gives double current at half voltage. This change is accomplished by shifting the connections from series to multiple, and is convenient in testing switches commonly having double ratings such as 5 amp., 250 volts, or 10 amp., 125 volts.

Where loads of larger capacity than the lamp bank are desired a rheostat is used. This rheostat has a capacity of 160 amp. at 230 volts, adjustable in 2-amp. steps. It is made of grids and tubes in an iron frame with casters and having a slate front with contact dials, switches and circuit breaker. For still larger loads a water barrel on a portable stand is used. Graphite disk rheostats are also used for low-voltage work in connection with the plating generator and the low-voltage transformer.

Sockets and switches are subjected to an endurance test of 6000 operations while connected as in service to a supply line and load of their rated capacity. For this purpose special machines are used. For push-button switches six samples are mounted on frames and adjusted in position facing six sets of plungers. These plungers are alternately pushed in and withdrawn mechanically, operating the switches ten times a minute. The motion is derived from a small motor operating through a worm and gear, the number of operations being recorded by a revolution counter. For pull-chain sockets a motor-driven mechanism travels up and down and operates the sockets by hooks clipped on the chains. Key sockets and rotary switches are similarly operated by forked shafts which turn the keys or buttons. The machines are separate and any one can be wheeled to the test panel. This panel is specially devised for these tests and supports six dimmer rheostats with separate control switches and suitable terminals for the connection of the line and load. Each circuit includes a lamp to indicate visually the operation of the device under test.

For rating tests on plug fuses a portable table is provided, carrying a sign-lighting transformer connected to the line by a flexible cord. The low-voltage side supplies two test circuits. Each circuit includes six single-pole cut-out bases mounted on the table top and permanently wired with shunting switches to be closed in the event of a fuse blowing. Each circuit includes a compression disk rheostat for varying the current from 4 amp. to 100 amp. Short-circuit tests on fuse plugs are made from a 2000-amp.-hr., 125-volt storage battery isolated in the substation of a large public service company. From the battery leads extend through a closing switch to the fuse under test, a "Nichrome" rod with a sliding contact being included in circuit to adjust the resistance to a low specified value. A 2000-amp. toggle switch, operated by a rope on the handle, is also placed in circuit. This switch is an emergency device for clearing the circuit in event of sustained arcing at the fuse.

For voltage-breakdown tests a 10-kva. oil-filled transformer is used. This transformer is energized from an alternator, the desired voltage being obtained by adjusting the generator field without introducing resistance or reactance into the transformer circuit. The high-tension winding comprises eight coils, each producing a maximum emf. of 2000 volts and capable of being connected in various combinations of series and parallel, giving full transformer capacity at voltages of 2000, 4000, 8000 and 16,000. The voltage is measured by a separate coil on the transformer core connected to a voltmeter reading 100 volts at full secondary voltage. The transformer is being mounted in a glass-walled case with a sliding door. The door is interlocked with a switch in the primary circuit and if opened automatically "kills" the transformer.

While the above equipment is sufficient for most of the test work, there is occasional need for lines of other voltages, frequencies or capacities, or for special apparatus for which in this work there is but limited demand. In these cases the Laboratories have availed themselves of the courtesy and co-operation of three large public service companies which have kindly offered their facilities. Special tests have also been conducted at a nearby engineering school. These outside facilities have been used for testing several devices, including fuses, auto-starters and cable connectors.

The electrical department is under the direction of Dana Pierce, vice-president and electrical engineer. Mr. Pierce also has personal charge of the New York office and testing station, assisted by Edgar P. Slack, H. C. Mathey and C. H. Holway, assistant engineers.

Making the Rates Carry the Coal Cost

Extra Burden Put Upon Electrical Utilities by the Heavy Advance in Fuel Prices and the Continued Scarcity in Supply Lead to Higher Schedules for Power

OPERATING costs and the power rates which show a slender margin of profit demand vigilant analysis from central station properties. It is so difficult to control expenses and the outlook for material and labor costs is so uncertain that companies will have to check results very carefully in order to avoid dangerous losses on some classes of business.

At present the acute point is of course the coal situation. Costs in this direction have passed completely beyond the control of the individual central station company. During last winter ownership of mines and contracts with established mining companies were only partial safeguards because of car shortage, locomotive shortage and the congestion of traffic which combined to paralyze railroad service. Purchases in the open market were necessary to maintain central station service and exorbitant prices swelled expense accounts.

Foreseeing continued large requirements for power, apprehensive of still higher cost of coal and other materials, it is logical that the companies should take steps to protect themselves by increasing rates, particularly rates on energy used for power purposes. The method adopted by many companies, which is direct and effectively provides for higher coal cost, is to introduce a coal clause into power schedules. This makes changes in rates precisely as coal cost advances or declines from a normal base cost.

Without some such arrangement in rate schedules, companies will face the coming winter with doubts which may develop into burdens seriously reducing their net earnings. It is not alone a question of a promise or guarantee that they shall have their necessary coal supply at an agreed price, for to a large extent they had that last year. They want to be certain that service shall not be crippled because of breakdown in transportation or any other link of the chain from mine to boiler room.

Great Work at Washington

Central station companies need to provide as full protection as possible against exigencies in any part of the coal situation. They naturally welcome the great work of the committee on coal production of the Council of National Defense. The confident expectation is that the activities of this committee, in co-operation with other government authorities and the coal producers, will relieve the situation materially.

It may be asserted with just as much confidence, however, that the executives of electrical companies do not feel that the menace in either price or supply of coal has been removed entirely by the results of the recent conferences at Washington. If runaway markets are prevented, if adequate supplies are made available, these accomplishments will be of incalculable value in the maintenance of electric service unimpaired. The critical coal conditions just at present are so far from entirely normal, however, that expectations are not being raised too high.

Undoubtedly optimism has been created by the announcement from Washington that in general a base price of $3 per ton for bituminous coal on cars at the mines might be expected. This looks attractive to the operator who paid $7 and $8 for part of his supply last winter. It should be recalled, however, that the low price named is stated frankly as tentative and that later intimations are to the effect that this is a summer figure, subject perhaps to revision when cost sheets are scrutinized. Almost directly after the Washington announcement was made coal operators in one district in Illinois (Decatur) increased their price 55 cents a ton to a total of $3.90, advancing as a reason higher cost of production.

World-Wide Hunger for Commodities

In coal as in other raw materials the country faces the hungry grasp of a world in sharpest want for commodities. Government control of production and price by co-operation with industry, as in the case of coal, will enlarge output, will tend to limit profits, but it cannot overturn the general principles involved in the law of supply and demand. Whatever help is given from the government or volunteered by the coal operators will alleviate conditions but it will not restore the old scales upon which rate schedules of electric central station properties are based.

If coal should be held to a reasonable level, the power user whose rate fluctuated squarely with coal cost would derive full advantage of the improvement; while sharp advances would not find the central station suffering financially because of inflexibility in rates to consumers.

It is true that costs of other materials, as well as of labor, show similar large advances in price and present the same problem of scarcity; but, excepting labor, they do not enter so largely into pure operating expenses, they have to do more with capital expenditures. Higher coal cost can be provided for in no other place than operating expenses; it is an outlay which is gone forever. A construction expenditure enters into other elements of the whole plant, and is averaged with them into a figure of cost which, although permanent, is lightened by combination with other expenditures made when costs were lower. Nearly all other elements of operating expense are higher and replacements involve heavy expense, but they do not present as serious a problem as coal.

Interests with large electrical properties express the opinion that in the future coal costs will be higher than the average of the past. Men with excellent sources of information and experience on which to base their judgment believe that, looking beyond the critical time while the nation is at war, coal will inevitably be at a higher level for a period of years. They believe furthermore that coal will never be as low in price as the figures which prevailed widely a few years ago.

It is full realization and acceptance of the conditions outlined in the foregoing summary which have given so strong an impetus to the movement toward higher rates.

Conditions are not the same as when existing rate schedules were made; they will not be the same at any time which can be forecast definitely. Therefore the argument of a company which asks a state regulating commission for authority to advance rates in proportion as cost changes is incontrovertible.

In England, as a result of higher costs of coal and other commodities and of labor, 222 electricity supply undertakings have increased rates since the beginning of the war. That country has confronted abnormal conditions due to the war so much longer than this nation that it has gone farther in adjusting rate-making than properties in the United States. Owing to differences in ownership, methods of operation and marketing, conditions in the two countries are not fairly comparable on the same basis, but it is significant that so many of the English undertakings have adjusted rates to correspond with the new conditions.

Advices to the ELECTRICAL WORLD from different sources show the following partial list of properties which are making increases or inserting coal clauses in parts of their rate schedules, principally for power, applications to commissions pending in some cases:

Massillon (Ohio) Electric & Gas Company.
Cleveland Electric Illuminating Company.
Plymouth (N. H.) Electric Light Company.
Seattle municipal plant.
Westfield (Mass.) municipal plant.
Colonial Power & Light Company, Manchester, Vt.
Rockford (Ill.) Electric Company.
Utica (N. Y.) Gas & Electric Company.
Virginia Railway & Power Company.
Wheeling (W. Va.) Electric Company.
Virginian Power Company, Charleston, W. Va.
Tiverton (R. I.) Electric Light Company.
Troy (Ohio) municipal plant.
Companies in Indiana, combined action to increase rates.
Toledo Railways & Light Company.
Columbus (Ohio) Railway Power & Light Company.
Taunton (Mass.) municipal plant.
Northwestern Ohio Railway & Power Company.
New York Edison Company.
United Electric Light & Power Company.
Edison Electric Illuminating Company, Brooklyn.
Atlantic City Electric Company.
Duquesne Light Company, Pittsburgh.

NEW ENGLAND CENTRAL STATION RATE SITUATION

The adoption or consideration of coal clauses in New England central station power contracts is widely in vogue at present. Many companies are now paying $10 or more per ton for bituminous coal delivered either by water or by rail, and in general it may be said that the present average price of newly purchased coal is more than double the normal price of recent years. Few companies have so far undertaken to increase rates outside of their power schedules.

Following is a list of the companies (by cities) having coal clauses or contemplating their early use:

Agawam, Mass.; Amherst, Mass.; Beverly, Mass.; Brattleboro, Vt.; Claremont, N. H.; Concord, N. H.; Danbury, Conn.; Easthampton, Mass.; East Hampton, Conn.; Exeter, N. H.; Fall River, Mass.; Fitchburg, Mass.; Turners Falls, Mass.; Gas & Electric Improvement Company, 77 Franklin Street, Boston (North Adams, Clinton, etc.); Great Barrington, Mass.; Greenfield, Mass.; Hartford, Conn.; Haverhill, Mass.; Lowell, Mass.; Ludlow, Mass.; Lynn, Mass.; Malden, Mass.; Marion, Mass.; Middletown, Conn.; New Bedford, Mass.; North Abington, Mass.; Palmer, Mass.; Pawtucket, R. I.; Pittsfield, Mass.; Portland, Me.; Portsmouth, N. H. (approved by commission); Plymouth, Mass.; New London, Conn.; Revere, Mass.; Salem, Mass.; Springfield, Mass.; Stamford, Conn.; Waterbury, Conn.; Worcester, Mass. (New England Power Company).

Below are representative coal clauses:

New England Power Company, Worcester, Mass.—All new contracts for power service have coal clause. If cost of coal at tidewater in Providence, R. I., exceeds $4.50 per long ton, price of electricity increases by 0.01 mill per cent increase above $4.50. Similar reduction below $4 base. This is regarded as unusually fair to the small consumer, being based on an actual coal rate of 2 lb. per kilowatt-hour.

Brockton, Mass.—Increase of $0.00006 for each 5-cent increase in price of coal over $5 per ton.

East Hampton, Conn.—Increase of $0.0015 per kilowatt-hour for each $1 increase over $4 per ton.

Pittsfield, Mass.—Increase of 1.25 mill per kilowatt-hour above $4.50 base per $1 increase in coal price.

Portsmouth, N. H.—Increase approved by New Hampshire Public Service Commission, June 26, 1917. Consists of $0.00045 per kilowatt-hour for each whole 10 per cent or 40 cents increase above $4 per ton (long) f.o.b. company's wharf. Corresponding deduction. Coal clause does not apply to contracts prior to June 13, 1917.

Plymouth, Mass.—Increase of $0.001 per kilowatt-hour per $1 over $5 base.

New Bedford, Mass.—Increase of about 2.5 mills in power rate.

No general rate increases in prospect at this date in Boston, Worcester or Springfield. A rate increase is expected at Providence, R. I.

Hartford, Conn.—Increase in lighting rate of 4-5 mills per kilowatt-hour, by sliding scale. Company has coal clause.

IN PENNSYLVANIA

P. E. Fickenscher, acting chief bureau of rates and tariffs, Pennsylvania Public Service Commission, writes in reply to an inquiry that twenty-nine companies have filed tariffs recently. All the changes have not been analyzed yet, but the general trend is to make some increase in rates. The companies are:

Allegheny Valley Light Company, Pittsburgh.
Ambler Electric Light, Heat & Motor Company,
Berkshire Electric Company, Sinking Springs.
Cherry Tree Electric Heat, Light & Power Company.
Citizens' Light, Heat & Power Company of Pennsylvania.
Citizens' Light & Power Company, Oil City.
Coalport Light, Heat & Power Company, Coalport.
DuBois Electric Company.
Hanover Light, Heat & Power Company.
Harwood Electric Company, Hazleton.
Hyndman Electric Light, Heat & Power Company.
Jefferson Electric Company, Punxsutawney.
Lehighton Electric Light & Power Company.
Mansfield Electric Company.
Montgomery & Muncy Light, Heat & Power Company.
Ortanna Electric Light & Power Company.
Northern Cambria Light, Heat & Power Company.
Northwestern Electric Service Company, Erie.
Penn Electric Service Company, Johnstown.
Penn Central Light & Power Company, Altoona.
Rossiter Electric Company, Clearfield.
Schuylkill Gas & Electric Company, Hazleton.
Scranton Electric Company.
Sherman's Valley Electric Company, Loysville.
Steffen Electric Company, Township of White.
Union City Electric Company.
Warren Light & Power Company.
Waynesboro Electric Company.
Weimer Electric Light & Power Company, Lebanon.

Results of April Light and Power Operation

Income of $38,000,000 Shows Increase Over Previous April of 13.9 per Cent—Output Amounted to 2,180,000,000 Kw.-hr., an Increase of 22.8 per Cent

DURING the month of April last the earnings of the central stations of the United States from the sale of energy only were approximately $38,000,000, according to the returns received and compiled by the ELECTRICAL WORLD. For the same month the output sold was 2,180,000,000 kw.-hr. The increase in income, in comparison with April, 1916, amounts to 13.9 per cent and in output to 22.8 per cent.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1916	1915	Per Cent Increase	1916	1915	Per Cent Increase
May	64	20,345,000	17,559,000	16.0	1,170,143,000	944,681,000	24.0
June	64	20,254,000	17,551,000	15.4	1,170,679,000	968,724,000	21.0
July	64	19,760,000	17,301,000	14.2	1,174,374,000	976,704,000	24.4
Aug.	64	20,502,000	17,861,000	15.0	1,262,575,000	1,015,805,000	22.4
Sept.	64	21,432,000	18,600,000	15.2	1,268,339,000	1,037,976,000	21.2
Oct.	64	22,882,000	20,164,000	13.5	1,347,502,000	1,125,132,000	19.9
Nov.	64	24,819,000	21,744,000	14.4	1,396,537,000	1,148,221,000	21.7
1917		1917	1916		1917	1916	
Dec.	62	25,306,000	22,029,000	15.0	1,345,883,000	1,112,280,000	21.0
Jan.	63	27,408,000	23,969,000	14.4	1,495,829,000	1,180,884,000	26.7
Feb.	63	25,204,000	22,295,000	13.1	1,240,995,000	1,036,014,000	20.0
March	62	23,897,000	20,865,000	14.5	1,406,065,000	1,136,652,000	24.3
April	58	22,011,000	19,342,000	13.9	1,265,340,000	1,031,407,000	22.8

Summing up for the first few months of the current year, it is found that the income from light and power sales amounted in round figures to $160,000,000. At this rate it becomes evident, barring a reversal of existing conditions, that the central station industry will pass the half-billion mark for the first time in 1917.

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April
INCOME:										
Group 1	13.8	13.9	15.0	11.6	13.0	15.0	12.0	12.5	13.0	12.0
Group 2	16.8	15.7	20.4	19.2	17.7	16.6	19.0	19.7	20.7	20.0
Group 3	19.5	20.9	18.4	18.5	18.2	15.2	15.2	12.5	15.1	15.1
Group 4	9.0	9.5	11.3	13.5	12.8	12.3	15.5	10.3	19.1	17.0
Group 5	12.2	14.9	13.3	16.0	12.8	9.5	20.2	57.5	16.1	19.2
OUTPUT:										
Group 1	18.1	21.4	18.5	16.6	18.2	18.7	22.5	19.0	20.0	19.0
Group 2	22.9	33.0	32.9	31.1	27.2	20.2	30.5	24.0	35.7	38.0
Group 3	27.8	31.1	19.3	24.0	32.0	28.8	34.4	14.8	25.1	24.9
Group 4	16.1	23.0	26.0	20.4	19.7	21.0	30.5	20.2	26.1	28.0
Group 5	11.6	16.8	15.3	18.3	33.0	25.4	21.3	21.7	44.0	22.7

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April
INCOME:										13.8
Group 1	12.6	9.6	16.5	12.1	13.5	12.5	12.5	12.3	7.0	18.7
Group 2	20.6	15.1	25.5	21.3	20.0	30.2	16.1	18.4	18.2	25.3
Group 3	21.2	15.0	20.5	18.0	19.4	16.5	17.8	15.7	16.5	24.3
Group 4	6.2	11.1	10.5	15.4	16.0	16.0	22.0	12.8	25.8	24.0
Group 5	14.9	17.5	18.3	18.2	18.6	12.2	24.0	15.1	21.0	
OUTPUT:										
Group 1	19.2	31.3	34.0	17.5	18.0	10.8	20.7	19.6	24.0	18.2
Group 2	14.1	32.0	37.7	35.0	24.7	18.2	24.8	18.5	21.1	23.2
Group 3	31.4	45.5	32.4	42.6	35.9	22.0	20.9	35.7	34.5	38.2
Group 4	26.6	39.4	32.9	48.9	40.0	55.2	73.8	38.1	32.7	58.0
Group 5	13.5	21.3	27.4	22.0	17.0	35.7	29.2	26.8	76.0	29.0

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States			Percentage of Industry Represented	Atlantic States			Percentage of Industry Represented	Central States (Illinois Excluded)			Percentage of Industry Represented	Pacific and Mountain States		
			1916	1915	Per Cent Increase		1916	1915	Per Cent Increase		1916	1915	Per Cent Increase		1916	1915	Per Cent Increase
INCOME	May	65	2,103,000	1,788,000	17.0	67	8,226,000	7,131,000	15.4	56	6,085,000	5,123,000	18.7	88	3,874,000	3,469,000	11.6
	June	65	2,208,000	1,906,000	16.0	67	8,045,000	6,905,000	16.5	56	6,007,000	5,143,000	16.9	88	4,017,000	3,539,000	13.5
	July	65	2,130,000	1,875,000	13.7	67	7,832,000	6,721,000	16.4	56	5,926,000	5,095,000	16.3	88	3,755,000	3,493,000	7.6
	August	65	2,203,000	1,935,000	13.7	66	8,000,000	6,875,000	16.4	56	6,195,000	5,266,000	17.7	88	3,883,000	3,582,000	8.4
	September	65	2,315,000	1,982,000	16.8	66	8,631,000	7,445,000	16.0	56	6,505,000	5,537,000	17.8	88	3,979,000	3,644,000	9.2
	October	65	2,684,000	2,331,000	15.2	65	8,887,000	7,930,000	12.1	56	6,968,000	5,895,000	18.2	87	4,213,000	3,889,000	8.3
	November	65	2,912,000	2,516,000	15.7	65	10,061,000	8,859,000	13.5	56	7,410,000	6,313,000	17.4	87	4,246,000	3,947,000	7.5
	December	65	3,203,000	2,814,000	14.0	66	11,059,000	9,348,000	19.6	56	7,898,000	6,997,000	13.0	75	2,987,000	2,735,000	9.3
	1917		1917	1916			1917	1916			1917	1916			1917	1916	
	January	64	3,181,000	2,762,000	15.1	66	11,400,000	9,874,000	15.6	56	8,081,000	7,013,000	15.2	86	4,602,000	4,020,000	9.5
	February	64	3,039,000	2,686,000	13.1	65	10,249,000	9,021,000	13.6	55	7,471,000	6,530,000	14.4	86	4,284,000	3,926,000	9.2
	March	62	2,809,000	2,499,000	12.4	64	10,203,000	8,902,000	14.7	55	6,692,000	5,754,000	16.5	86	4,193,000	3,780,000	11.0
	April	59	2,620,000	2,235,000	17.2	54	8,150,000	7,358,000	10.7	53	7,041,000	6,012,000	17.5	82	4,044,000	3,609,000	12.0
KW.-HR. OUTPUT			1916	1915			1916	1915			1916	1915			1916	1915	
	May	65	84,719,000	64,318,000	31.8	67	409,529,000	333,585,000	22.0	56	345,860,000	275,328,000	25.6	88	328,793,000	266,599,000	23.2
	June	65	87,829,000	69,506,000	27.6	67	396,630,000	327,541,000	21.2	56	350,015,000	288,982,000	21.2	88	328,996,000	277,915,000	18.6
	July	65	85,317,000	71,160,000	19.8	67	401,179,000	333,771,000	20.3	56	350,708,000	287,407,000	22.2	88	325,647,000	279,285,000	17.4
	August	65	97,197,000	72,900,000	33.4	66	433,129,000	344,730,000	25.7	56	374,327,000	295,866,000	26.5	88	333,468,000	279,976,000	19.1
	September	65	98,350,000	73,343,000	34.2	66	446,534,000	369,815,000	20.8	56	387,626,000	307,485,000	26.2	88	335,817,000	288,332,000	16.4
	October	65	107,756,000	83,705,000	28.8	65	426,151,000	373,705,000	14.2	56	408,364,000	324,509,000	25.9	87	355,014,000	306,828,000	15.8
	November	65	111,873,000	89,015,000	25.7	65	533,252,000	424,746,000	25.6	56	415,491,000	334,044,000	24.4	87	346,847,000	293,518,000	18.2
	December	65	117,763,000	97,387,000	21.0	66	535,410,000	444,923,000	20.4	56	425,510,000	354,258,000	20.0	75	256,006,000	206,838,000	23.8
	1917		1917	1916			1917	1916			1917	1916			1917	1916	
	January	64	120,211,000	93,163,000	29.1	66	564,699,000	429,432,000	31.5	56	437,923,000	351,335,000	24.5	86	363,094,000	298,990,000	21.4
	February	64	110,114,000	88,324,000	24.7	65	418,407,000	341,877,000	22.5	55	373,988,000	323,158,000	15.8	86	326,891,000	274,079,000	19.3
	March	62	118,370,000	92,714,000	27.9	64	539,028,000	425,376,000	27.0	55	383,046,000	311,841,000	23.0	86	365,541,000	301,721,000	21.3
	April	59	101,861,000	80,696,000	26.3	54	418,827,000	337,338,000	24.2	53	386,216,000	314,120,000	23.0	82	347,417,000	290,667,000	19.4

Output for the first four months of 1917 was 8,780,000,000 kw.-hr. The increase in income over the corresponding period of the previous year amounts to 13.8 per cent, or in round figures to $20,000,000. The increase in output amounts to 23.4 per cent, which in the aggregate is approximately 1,660,000,000 kw.-hr.

LARGER VOLUME OF INCREASE

All sections of the country generally reported consistently favorable results. The great increase in power load is very evident in the maintained high rate of increase

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April
INCOME:										
Group 1.....	16.8	16.1	16.2	10.7	13.7	18.8	15.0	13.0	14.3	8.8
Group 2.....	18.5	21.6	19.0	21.0	22.5	21.7	28.3	27.3	27.0	22.5
Group 3.....	14.2	15.0	14.0	14.6	13.0	13.4	12.5	10.4	15.1	13.9
Group 4.....	10.0	14.4	9.8	13.5	13.1	14.4	14.0	11.3	20.5	16.2
Group 5.....	13.0	19.4	8.9	14.3	16.0	14.3	11.1	11.8	12.5	6.3
OUTPUT:										
Group 1.....	23.4	28.5	23.6	19.2	20.8	21.5	32.5	22.0	21.3	22.2
Group 2.....	27.4	32.5	26.7	33.0	31.9	28.2	42.6	31.2	63.2	36.5
Group 3.....	11.5	16.0	24.7	4.5	19.0	15.9	27.2	21.2	21.6	25.5
Group 4.....	16.3	29.5	18.6	17.5	14.6	16.0	25.4	18.8	20.2	25.0
Group 5.....	13.5	20.4	1.3	1.5	5.8	6.9	9.4	17.0	3.2	10.0

over the previous years. Last year was a tremendous year, and the increase over 1915 was large, but in spite of that 1917 is outstripping 1916 far more in volume of business handled than 1916 did 1915. The percentages of increase remain practically the same, but the quantity of increase is much larger.

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April
INCOME:										
Group 1.....	15.8	16.5	16.6	18.0	16.5	13.0	15.5	14.5	16.0	16.6
Group 2.....	17.3	21.8	21.5	21.0	17.0	16.0	17.8	18.7	21.0	21.7
Group 3.....	18.6	18.4	13.4	10.9	13.0	1.8	6.0	0.5	4.4	5.7
Group 4.....	17.5	10.7	20.0	19.7	16.8	15.5	19.8	16.3	18.9	22.0
Group 5.....	6.1	11.8	11.0	18.4	14.3	†	19.3	16.7	11.0	31.3
OUTPUT:										
Group 1.....	21.0	24.3	22.3	24.9	24.8	22.3	25.4	19.2	22.0	19.5
Group 2.....	25.7	36.4	40.0	31.7	29.7	24.4	29.0	23.6	32.4	44.4
Group 3.....	26.0	25.7	20.7	17.3	19.7	1.2	5.8	30.0*	4.5	3.0
Group 4.....	21.1	23.0	33.8	26.1	21.2	21.4	24.5	13.0	25.7	22.0
Group 5.....	8.6	6.1	13.7	28.2	16.8	9.9	15.5	17.1	23.5	17.9

*Decrease.
†Results omitted owing to insufficient returns.

So rapidly has new power business come to central stations that in a number of cases it has been found necessary to call in the power salesmen owing to the lack of generating facilities. The coal situation has played the most prominent rôle in this connection. Not only have prices been extremely high but it has been very difficult to obtain a sufficient quantity of fuel at any price. Should the government approve of the action taken last week by the coal mine operators cheaper fuel can be expected.

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April
INCOME:										
Group 1.....	4.7	5.5	6.2	4.2	4.5	4.0	5.4	7.2	8.5	11.3
Group 2.....	0.6*	0.7	4.9	1.3	3.0	3.6	7.5	5.5	0.6	3.4
Group 3.....	28.3	32.5	28.5	32.4	31.0	30.0	27.6	23.5	22.8	19.7
Group 4.....	1.0	0.5	11.5	7.2	0.4	0.6*	8.6	2.0	13.2	8.3
Group 5.....	13.2	13.0	11.7	13.5	17.1	11.1	20.3	14.9	15.2	9.5
OUTPUT:										
Group 1.....	10.0	6.3	7.1	5.2	8.0	8.6	11.0	22.3	15.6	15.8
Group 2.....	2.0	6.5	7.8	9.7	11.4	8.7	11.8	16.2	8.9	16.1
Group 3.....	56.1	57.5	60.0	63.7	61.3	48.0	59.5	36.8	36.3	29.7
Group 4.....	4.0	7.5	12.0	*0.5	4.2	2.6	15.2	14.0	27.9	20.0
Group 5.....	10.8	16.5	7.0	14.7	42.3	5.4	19.1	9.4	21.6	20.5

*Decrease.

It is doubtful if the income figures for April reflect the increase in power rates prompted by the seriousness of coal supply and cost. In subsequent months, however, this factor will probably become increasingly evident.

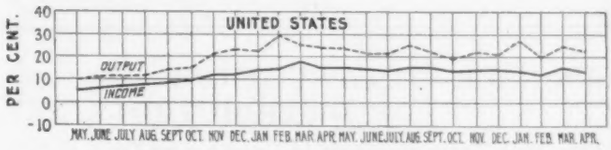
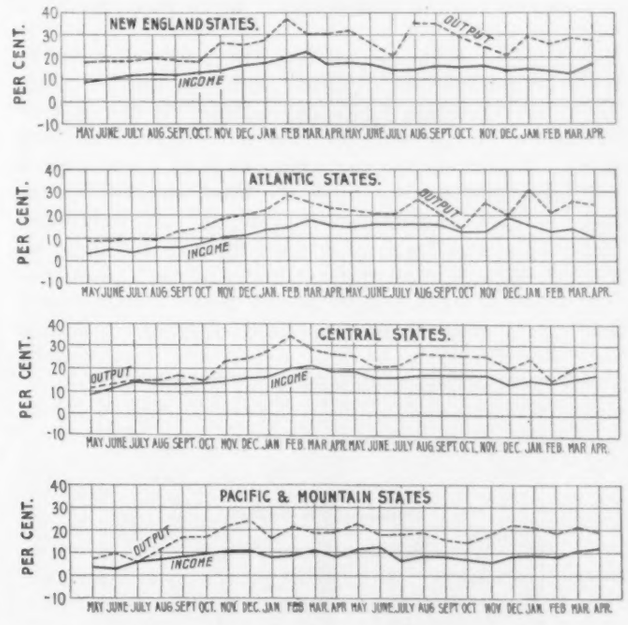

UNITED STATES
PER CENT.
OUTPUT
INCOME
MAY. JUNE JULY AUG. SEPT OCT. NOV DEC. JAN FEB MAR APR. MAY. JUNE JULY AUG SEPT. OCT. NOV DEC. JAN. FEB. MAR. APR.

FIG. 1—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

From the condition of the manufacturers' order books, showing vast volumes of unfilled orders for energy-using apparatus both for domestic and industrial application, there is every reason to believe that, provided always there is sufficient room in generating equipment for growth, similar large percentages of increase can be expected for some time to come. That the central stations expect it is evident from the state of the turbine market for larger sizes. The market is practically sold out until well into 1920.

The accompanying curves show graphically the percentages of growth both in income and output as contained in Tables I and II. The remaining tables give the percentages of growth in income and output for the companies grouped according to the size of the community served. Thus group 1 represents those companies operating in cities having a population of over 100,000 inhabitants, group 2 those operating in cities having between 50,000 and 100,000 inhabitants, group 3 cities between 25,000 and 50,000, group 4 between 10,000 and 25,000, and group 5 those between 5000 and 10,000.



FIGS. 2 TO 5—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

BUS RACK CONSTRUCTION FOR DISTRIBUTION LINES

How This Type of Work Is Used by an Ohio Public Service Company in Order to Save Space on Poles

As a means of eliminating objectionable buck-arm construction, of providing adequate climbing space for linemen, and of making a line which is easy to wreck for reconstruction purposes, the Northern Ohio Traction & Light Company, Akron, Ohio, has adopted the types of bus rack construction shown in Fig. 1. Ordinarily the three-pin racks are mounted at the ends of the arm (Fig. 2), with the bus wires strung between them. Taps from the secondary leads to the bus wires are made and service lines are then attached to the racks. The advantages of moving the connection points of service leads away from the pole are apparent when considered from the standpoint of the convenience and safety of linemen and trouble men. Furthermore, this type of construction, especially where drops extend in both directions from the pole, tends to assist in attaining proper pole and arm alignment without guys.

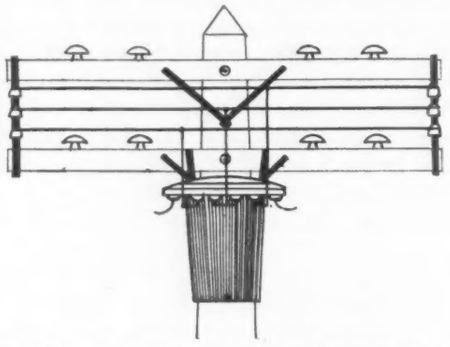


FIG. 1—METHOD OF MOUNTING BUS RACKS BETWEEN FIRST AND SECOND ARMS TO SAVE SEVERAL FEET OF POLE SPACE

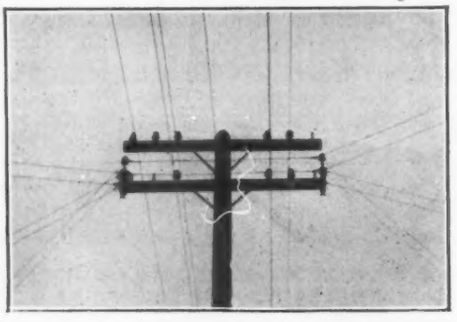


FIG. 2—FRONT OF A POLE WHICH WOULD REQUIRE BUCK ARMS FOR SERVICE IF RACKS WERE NOT USED

In order to reduce the pole space necessary on poles where transformers are hung the company has lately been experimenting with bus racks fastened between the outer ends of the two top cross-arms. The vertical channel sections of the racks, as they are received from the manufacturers, are not long enough to reach from one arm to another. To get around this trouble cross-arm braces are bolted from arm to arm at the outer ends, and the racks are then bolted to these braces as is shown in Fig. 1. This permits the bus wires to be raised enough so that the transformer can be mounted directly on the second arm. Secondary taps from the transformer can be connected directly to the bus. Considerable pole space is gained by this scheme. The plan is particularly valuable in joint pole construction, since it may permit an actual reduction in the height of pole necessary to carry both lighting and telephone lines.

W. E. Salber, who has worked out this plan for the Northern Ohio Traction & Light Company, suggests that manufacturers of pole-line hardware might well consider making racks with vertical channels long enough to span the distance between the two top arms of a two-arm lead.

MOVING A HEAVY ROTOR WITH BLOCK AND TACKLE

Ropes Stretched Between Two Sets of Block and Tackle and Wound Around Rotor Served as Motive Power and Brake

BY J. C. RUTHERFORD

A simple method of using blocks and tackle to move a rotor into place was employed recently with a considerable saving in time and money compared with other methods. In the opinion of the writer the method is deserving of more frequent application. The rotor, which weighed about 50,000 lb. (22,679.6 kg.), crated in a box of heavy timbers and securely braced and blocked, had been brought to the place where it had to be installed on a horse-drawn truck. As the station floor was about 15 ft. (4.6 m.) above the street level an incline was built of timbers to facilitate moving the machinery from the street to the station floor. Although the transom over the doorway had been removed, there still remained about 1 ft. (30.5 cm.) of brickwork which obstructed the entrance of the rotor and its crate.

Tearing out this brickwork meant more than it actually implied, because at one side of the door a number of 2200-volt circuits passed through the brick wall almost immediately above the transom. Careful measurement showed that if the crate holding the rotor were removed and the rotor let down so that the periphery came within about 1 in. (2.54 cm.) of the floor it would not be necessary to remove any of the brickwork. Consequently the crate was carefully centered in the doorway, and the supporting timbers on the side of the crate

in the direction of travel were cut at an incline so that when the rotor was rolled in toward the station it would gradually descend toward the floor.

Next a timber staging was built, upon which planks were placed to make a smooth runway for the shaft from the crate to the bedplate. Then a set of blocks and tackle was hitched to some of the structural steelwork in the direction of travel and to a rope wound around the outside of the rotor about four times. The other end of the rope was attached to another set of blocks and tackle which was fastened in the rear. When the rope was kept taut the friction around the rotor prevented its rolling backward by gravity. However, by drawing in the forward tackle and letting out the rear tackle the rotor was made to roll up the staging to the bedplate. Once inside the station it was a simple matter to raise the runway to a height that permitted lowering the rotor into the bearings when it reached them by means of jacks.

UTILIZING FANS TO VENTILATE MANHOLES

Box Containing Ordinary Fan Is Mounted at Top of Pipe Which Is Connected with the Manhole Requiring Ventilation

BY N. NESBITT TEAGUE

Augusta-Aiken Railway & Electric Corporation

Manholes on the system of the Augusta-Aiken Railway & Electric Corporation are exceedingly hot in the summer owing to loaded transformers and climatic heat, temperatures of 118 deg. Fahr. (47.8 deg. C.) being not infrequent in the holes. For this reason this company has ventilated the manholes where this is possible. In addition to providing the usual holes in the manhole cover, a 4-in. (10.2-cm.) pipe is connected with the manhole and extended above ground several feet. On the upper end of each of these pipes is placed a small wood box with a hole cut in the front as shown in the accompanying illustration. Just back of the opening in the box is an ordinary 12-in. (30.5-cm.) electric fan which forces air into the manhole, where it

VENTILATING FANS MOUNTED ON STANDPIPE AND ON POLE

is allowed to discharge through openings in the manhole cover. By this method it has been possible to lower the temperature of the manholes about 22 deg. Fahr. (12.3 deg. C.). In this way the manholes have been made more comfortable to work in and the transformers are kept cooler, thus permitting the carrying of heavier loads. These ventilating fans are operated all winter for circulating the air and keeping the manholes in a dry condition.

METHOD OF LAYING OUT BLOW-OFF PIPING

Construction of Brick Blow-off Pits as Well as Basins Serving Separate Blow-off Pipes—Some Factors to Consider

BY T. W. REYNOLDS

Blow-off piping can be made up with bends, Y-fittings and stop valves, as shown in the sketch, so the discharge will be always in one general direction. The upper blow-offs are provided with T's and check valves, to serve as

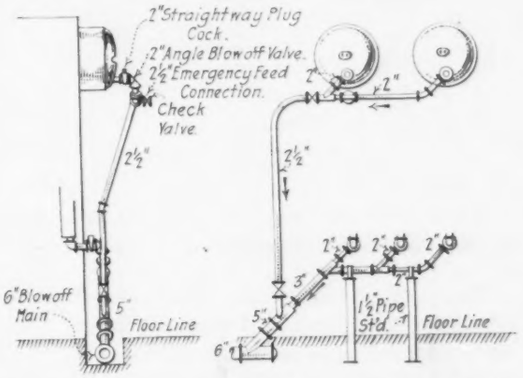


FIG. 1—BLOW-OFF PIPING ARRANGED TO DISCHARGE IN ONE GENERAL DIRECTION

emergency feed connections or so they may be used when a test is run. Each blow-off outlet from the boiler is provided with one straightway plug cock and one angle blow-off valve.

The main blow-off pipe is run in a concrete trench back of the boilers and is covered with a cast-iron checkered plate divided into short sections. The discharge opens outside the plant into a buried circular brick blow-off pit having a concrete bottom and cast-iron manhole frame. Iron rods in the brick walls serve as steps when cleaning out mud and scale from the pit. Failure to clean out or inspect the basin at proper intervals may result in a clogged outlet and an explosion even though the stoppage is only momentarily. Directly under the entering blow-off pipe is a cast-iron plate embedded in the concrete which prevents erosion of the concrete bottom.

The blow-off pipe should enter the pit at a point higher than the outlet to the sewer, while the latter should be extended full size to the sewer main. Failure to do so may result in dangerous and destructive water hammer when blowing off, as water may back up into the blow-off pipe. Where more than one blow-off pipe enters a basin, the sewer outlet should be of greater area than the total area of all entering pipes. The deeper the tank the less steam will be blown into the sewer. A 30-in. (7.6-cm.) space should be left between the water line and top of tank, into which steam can discharge.

Where the law requires that each blow-off from a boiler be run independently to the blow-off basin, a vertical iron tank may be sunk in the floor at the rear of the boilers where it will be centrally placed. The blow-

off pipes may enter through inlets flanged around a circle in the top header, leaving blanked inlets for future connections. The number of pipes, together with a manhole in the center, determine the diameter of the

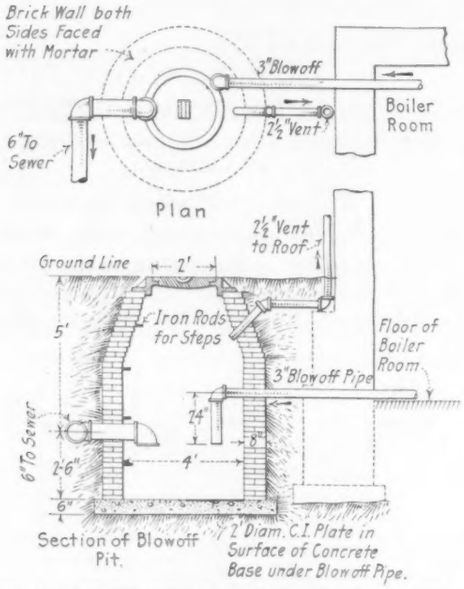


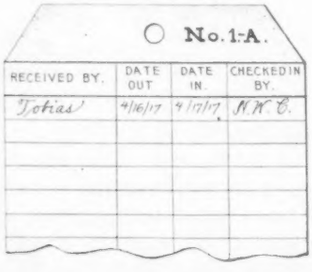
FIG. 2—CONSTRUCTION DETAILS OF BLOW-OFF PIT

basin. The manhole should be equipped with a yoke and gasket, discharge and vent pipes being provided as previously described. Sudden pressure from a blow-off valve opening quickly, or from more than one opening at a time, are the principal causes of temporary excess pressures. For this reason and to allow for the corrosion of the iron it is imperative that tanks be constructed of ample thickness. Pipes should not be run above the floor at the back of boilers since floor and wall spaces at the rear of boilers are important in an emergency.

RECORDING LOCATION OF PORTABLE METERS IN USE

Method of Keeping Record of Persons Using Portable Meters That Involves No Elaborate Bookkeeping

All portable meters of the Mahoning & Shenango Railway & Light Company of Youngstown, Ohio, when not in use are kept in a cabinet in the meter laboratory. The rating of each meter and its number are written



SHIPPING TAG USED AS PORTABLE-METER RECORD

on a card which is permanently fastened near the position devoted to the corresponding meter. Near each identification card is hung an ordinary shipping card also bearing the meter number and having spaces on which the name or initials of persons drawing out the meter can be entered with the date of issue and return.

For instance, if the line foreman wants an ammeter he writes his name and the date on the corresponding shipping tag. When he has finished using the instrument he returns it to the cabinet and one of the metermen in the laboratory puts the return date and his initials on the card to signify that the meter was received in good condition, to all outward appearances.

The advantage of this plan is that it eliminates bookkeeping and minimizes the amount of necessary record keeping. At the same time it gives a record of the location of all meters at all times and prevents men from keeping them out unnecessarily long. When the tags are filled on both sides they are filed, thus affording a complete and continuous history of each meter.

WOOD-FRAME LOADING CRANE

Apparatus by Means of Which One Man Handles 5-Ton Loads at Oregon Lumber Mill

To facilitate loading heavy timbers and general yard lumber on flat cars, the Booth-Kelly Lumber Company, Eugene, Ore., has installed a wood-frame traveling crane which is capable of transferring loads from the motor trucks to cars in two lifts. With this apparatus two men can transfer 5000 ft. (1524 m.) of lumber from motor truck to car in approximately

LOADING LUMBER ON FLAT CARS AT THE RATE OF 10,000 FT. AN HOUR

twenty minutes. Allowing for delays, etc., the crane thus has a capacity of at least 10,000 ft. (3048 m.) per hour. The crane proper has a span of 25 ft. (7.6 m.) center to center of tracks. The runway is 28 ft. (8.5 m.) long, thus allowing the loading of two cars by shifting a little. Owing to the lack of space no batter brace posts could be used. Instead 8-in. by 8-in. (20.3-cm. by 20.3-cm.) posts were put up behind the main posts with 8-in. (20.3-cm.) packing blocks between to give the crane clearance. A 22-ft. (6.7-m.) clearance is provided above top of rail. The crane proper is carried on four 16-in. (40.6-cm.) single-flanged wheels, which run on 30-lb. (13.6-kg.) railroad rails. Bolted on top of the wheel trucks are two beams which carry very light rails for the trolley to run on. The trolley and the crane are designed to handle 5-ton (4.5-t.) loads with one man operating.

CENTRAL STATION SERVICE

A Department Devoted to Commercial Policy and Management Topics, Including Applications of Electric Light, Power and Heat

COST OF ADVERTISING FOR LIGHTING UTILITIES

Gas and Electric Companies Spend About 1 Per Cent of Gross Business, Including Both Appliance and Energy Sales

In a paper recently presented before the Empire State Gas and Electric Association, Thomas R. Elcock of the United Gas Improvement Company of Philadelphia referred to the cost of advertising, pointing out that utility companies spend much less than department stores in proportion to the sales. While the latter spend from 3½ per cent to 6 per cent of their gross business, gas and electric companies spend about 1 per cent of their gross business, including the sales of appliances and the sale of gas or electricity.

A LOG OF HOUSEHOLD ELECTRICAL DEVICES

Detailed Figures Showing Daily Use of Appliances and Total Consumption of Electrical Energy by Family of Two

BY JOE E. KING

Assistant Engineer for Nevada, the Nevada-California Power Co.

A little over a year ago it occurred to the author that a complete log of certain representative electrical devices as used in a typical middle-class home would furnish data of unusual interest to the central station industry.

The home of the writer is certainly representative of a large class, and in addition possesses an unusually extensive array of popular electrical devices, all of which had been in use for at least a year prior to the commencement of this log. Twelve such devices are in general use, covering quite closely the field of electricity in the home.

Additional interest in this record may be lent by the fact that all cooking and heating of water is done electrically. In fact, an electric washing machine and a vacuum cleaner are about the only devices of wide popularity which are not represented in this log.

This record was kept accurately for a full year, starting May 1, 1915, and ending May 1, 1916. A separate meter was installed on each of ten different devices, another meter on two closely related and little used devices (percolator and samovar), and a twelfth meter on the lamps. Excepting the percolator and samovar, the energy consumption may be accepted as representative for the circumstances given. The data relative to the percolator and samovar are of doubtful value because neither tea nor coffee is used regularly.

Particular attention was given to the matter of water heating. With the apparatus installed we do not enjoy hot running water, although our immersion heater acts rapidly enough to make a fair substitute. It was impossible to segregate the energy used for heating water, but the energy so used will be approximately proportional to the number of times the disk stove and immersion heater were used for water heating. This indicates a total consumption for water heating of 375 kw.-hr., or 25 per cent of the total energy used for all purposes. Each meter was wired to a single outlet.

TABLE I—ENERGY CONSUMED FOR LIGHTING

No. of Lamps	Rating	Kind	Total Watts	Kw.-Hr. per Year
2	60-watt, 115-volt	Tungsten	120	.....
4	40-watt, 115-volt	Tungsten	160	.....
2	25-watt, 115-volt	Tungsten	50	.....
3	60-watt, 115-volt	Metallized*	180	.....
1	20-watt, 115-volt	Carbon*	20	.....
12			530	174

*Seldom used.

TABLE II—ENERGY CONSUMED FOR COOKING AND WATER HEATING

Name and Description	No. of Heats	Make	Makers' Rating, Watts			Kw.-Hr. per Year
			High	Med.	Low	
Nine-cup percolator, machine type, El Perco	Single	Hotpoint	440	..	..	9
Seven-cup samovar, pot type, El Teballo	Single	Hotpoint	440	..	..	
Toaster stove, type B	Single	Westinghouse	500	..	..	39
7½-in. frying pan, type A	Three	Westinghouse	660	330	165	122
Immersion heater, crookneck, El Boilo	Single	Hotpoint	600	..	..	272
9-in. disk stove, El Stovo	Three	Hotpoint	1200	600	300	374
Oven, type D	Three	Gen. Elec.	2000	1000	500	420

The use of one outlet per device worked very well with all devices except the immersion water heater, and the installation of a suitably marked double-throw switch obviated the necessity of two outlets for this device.

TABLE III—ENERGY CONSUMED BY GENERAL HOUSEHOLD CONVENIENCES

Name and Description	No. of Heats	Make	Maker's Rating, Watts, Average Input	Kw.-Hr. per Year
12-in. six-blade fan, induction, three-speed	....	Westinghouse		4
Sewing-machine motor, 1/20 hp., 1700 r.p.m.	....	Westinghouse		2
Iron, 6-lb	Single	Westinghouse	450	51
Bathroom heater, luminous radiator	Three	Gen. Elec.	High 1500 Med. 750 Low 375	22

The dwelling in which these tests were made ordinarily houses two adult persons, the writer and his wife. When visitors making more than a one-day stay were entertained the fact has been noted. All of the watt-

hour meters used in this log were checked by the writer just before they were installed and were rechecked by him just after their return to the meter shop. All meters were well within the limit of 2 per cent fast or slow usually allowed for meters used in service of this class. No attempt was made to use specially calibrated meters. The extreme temperatures recorded during the year of this report were 98 deg. Fahr. (36 2/3 deg. C.) on Aug. 29, 1915, and 3 deg. below zero Fahr. (—19 4/9 deg. C.) on Jan. 12, 1916.

The electrical energy used falls naturally into three general classes—lighting, cooking and water heating, and general household conveniences. Tables I, II and III show respectively the number and kind of lamps or appliances and the energy consumption for these three classes. Table IV is a complete log, with a detailed record of consumption.

TABLE IV—MONTHLY LOG OF HOUSEHOLD ELECTRICAL DEVICES

Month	Class 1	Class 2. Cooking and Water Heating												Class 3. General Household Conveniences								Monthly Totals	
	Lighting	Percolator and Samovar		Toaster Stove		Frying Pan		Immersion Heater		9-in. Disk Stove		Oven		Fan		Sewing-Machine Motor		Iron		Bathroom Heater		Connections Made §	Kw.-hr. for All Purposes
	Kw.-hr. Used	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.	Times Used	Kw.-hr.		
1915																							
May*	10	3	..	27	3	52	9	91	32	29	20	18	38	..	..	7	..	8	4	1	..	326	125
June	8	4	1	30	4	58	11	107	37	33	28	21	44	6	1	4	..	7	3	..	..	270	137
July†	10	11	1	31	3	48	12	127	42	39	37	14	37	15	2	8	1	12	6	..	..	305	151
August	9	9	1	30	3	35	6	72	28	42	33	19	30	9	1	..	..	6	4	..	..	222	115
September	14	7	1	28	3	36	6	77	21	48	34	21	42	..	..	4	..	12	4	1	3	234	128
October	19	6	..	29	3	43	7	75	19	49	37	24	41	..	..	2	..	7	5	3	7	238	138
November	19	6	1	29	3	34	5	40	10	62	47	23	26	..	..	2	.	10	5	1	1	205	117
December	21	5	1	30	3	62	12	57	11	34	31	24	41	..	..	9	..	10	4	2	2	233	124
1916																							
January†	21	20	2	30	4	58	12	72	21	51	34	26	45	..	..	5	1	7	6	7	7	276	153
February	16	3	..	30	3	60	13	78	19	36	25	18	29	..	..	5	..	10	3	..	..	240	108
March	17	6	..	32	4	64	14	76	20	35	24	19	32	..	..	9	..	10	3	..	..	253	114
April‡	10	1	1	25	3	36	15	38	12	16	15	11	24	..	..	6	..	8	4	3	2	144	86
Total	174	81	9	351	39	586	122	910	272	474	374	238	429	30	4	61	2	107	51	18	22	2856	1498
Average kw.-hr. used per connection		0.111		0.111		0.208		0.299		0.789		1.803		0.133		0.033		0.477		0.818		0.464¶	

*Entertained one visitor for three days. †Entertained one visitor for eight days ‡One member of family was away from home twelve days and both members were away from home for seven days. §Except lights. ¶Energy for lights excluded.

From the data observed and recorded in this log certain interesting averages have been derived. For instance, the average energy used per connection for each one of the different devices is of record and is of some value, although these figures would doubtless vary greatly with different individuals. Perhaps the most interesting figure derived from this log is what may be called the total average consumption per connection, which is 0.464 kw.-hr. For the purpose of making estimates this figure may be remembered as half a kilowatt-hour per connection.

It is evident from the data submitted herewith that such devices as fans, sewing-machine motors and heating pads when installed in a residence are of but little interest to the central station on an energy-using basis. Their only value to the central station must lie in their ability to popularize electric service on account of its adaptability over a wide range of applications.

VALUE OF NEWSPAPERS AS ADVERTISING MEDIUMS

Doubling Space Resulted in More Than Doubling New Profits for Merchandise Sales in Average-Sized Illinois City

In the city of Bloomington, Ill., with a population of a little more than 25,000 according to the 1910 census, newspaper advertising has been found by the central station to pay. This was disclosed in a paper before the recent meeting of electrical contractors at Peoria by C. F. Snyder, superintendent of light, heat and power for the Bloomington & Normal Railway & Light Company. In connection with advertising he said:

We are absolutely converted to the fact that the newspaper medium is the best and that the careful, consistent use of newspaper space will bring corresponding returns. For years central stations have looked upon newspaper advertising as a necessary evil required to placate the newspapers. Advertising has been a political and a public policy matter which might serve to temper the wind of criticism to the shorn lamb of public service, and many a central station operator has signed for a page of space with the fervent unexpressed wish that the publisher and his newspaper were in kingdom come. Doubtless advertising does in some cases have its indirect effect from this standpoint, but that is a question for managers and not for commercial departments. The fact remains, and in our case we have demonstrated it beyond a doubt, that it is a powerful selling force and that when properly used it is as necessary to a central station as it is to a department store.

In June of last year we doubled our newspaper advertising, with the result that we more than doubled our new profits from merchandise sales. In fact, we more than doubled our new-business expense with the pleasing returns of an increase of over 400 per cent in our new profits. Here are the figures of a typical month: We used to spend about $1,860 a month with a gross of $2,000 in the merchandise department. We jumped the expense to $3,900 and our sales

were $4,500, giving an average net of $600 against $140. Of this $4,500 gross business all the wiring, which represents over 50 per cent, was handled through the contractors.

We try to make our advertising copy attractive and appealing and get away from the old hackneyed, stereotyped methods wherever possible. Our house-wiring advertising campaign lasts twelve months in the year with four different strong intensified campaigns, and a different feature is brought out in each drive. A liberal use of newspaper copy is made and electric light is not featured alone. We appeal to the man who is not especially interested in light by talking appliances and labor-saving devices, and the easy-payment plan is strongly featured.

To be effective newspaper copy must be continuous and well connected. Spasmodic attempts do not bring results. You have an every-day story to tell, and you must keep telling it in a convincing and attractive manner. In Bloomington in six months by means of a carefully planned newspaper campaign and solicitation we sold over $6,000 worth of vacuum cleaners.

PLAN TO INCREASE REVENUE AFTER RATE REDUCTION

Central Station Company Offers Thirty Days' Free Trial of House-Wiring Installations and Secures 1250 Contracts in Fifty-two Days

Beginning March 1, the Union Gas & Electric Company of Cincinnati announced that it would put electricity in any home in Cincinnati on thirty days' free trial. The company's offer included wiring the house, putting in electric fixtures with glassware complete, and supplying service. If the customer was satisfied with the installation at the end of thirty days, he accepted it and paid for it either in cash or in eighteen easy monthly payments. If he was not satisfied, the entire job was removed free of cost to him. Furthermore, the company agreed to reinstall whatever lighting fixtures it had removed at the time electric wiring was placed in the home.

Arrangements were made for handling the wiring through the local contractors, the prices being such that it was possible to equip completely a five-room house, not counting halls, bathrooms and courts, for $59.75.

As a statement of its reasons for instituting such a campaign the company said in its advertisements: "We make this offer because the maximum electric rate has been reduced to 8.5 cents per kilowatt-hour. This makes it necessary for us to have many more customers in order to maintain our past income. The easiest way to get these new customers is to let residents along our regular lines try electricity for thirty days, we assuming all expense if the service is discontinued at the end of the trial period."

In commenting upon the campaign, W. A. Wadsworth of the Union company said: "We ran the campaign from March 1 to May 15 and secured 1250 wiring contracts. I cannot too strongly emphasize the satisfactory results of this trial feature. The contracts were all turned over to local contractors, who were paid the price mentioned in the schedule less 5 per cent. We found it possible for the customer using the convenient arrangement of the wiring schedule reproduced herewith to make up his own estimate on this form."

Among the conditions are found the following:

"All wires must be concealed between the floors and walls, excepting in brick walls. In the basement open work will be used, and where it is impossible to conceal the wires over the ceiling of the attic, molding must be used. All wires to side outlets in the attic to be concealed.

"The contractor must provide and install all necessary cut-outs. All cut-outs to be contained in a cabinet.

"The contractor must replace all carpets, rugs and flooring removed to install the wires.

"The contractor must run service wires from the point where the service enters the building to the center of distribution and make all necessary provisions for the installation and connection of the meter.

"Outlets or hardware not listed in the specifications will be installed by the contractor only on the written order of the applicant, who agrees to pay for such extra work at the rates then agreed upon.

"Prices of all fixtures include Mazda lamps, 40 watts or larger."

The following prices per outlet were quoted: Center fixture outlet, $1.80; side fixture outlet, $1.80; outlet and base receptacle, $3; outlet and drop cord with key-socket, $2.50; outlet and drop cord with chain socket, $2.75; outlet and single-pole flush switch, $3; two outlets and pair of three-way switches, $7; outlet and snap switch, $2.25; add for outlet under double flooring, $1; add for outlet under hardwood flooring, $3; wiring ready to run circuits (service mains, cut-outs, meter loop, etc.), $12.

A COMPREHENSIVE CENTRAL STATION APPLIANCE LIST

Not Intended for General Distribution, but Mailed to Selected List of Customers and Given to Those Interested in More Than One Appliance

A forty-eight-page catalog of electric appliances, entitled "Modern Home Comforts," has recently been issued by the Public Service Electric Company, Newark, N. J. This catalog, which is a comprehensive list of electrical appliances for household use, is not intended for general distribution, but is mailed to a selected list of customers and is also given out by the company's sales force to those who are interested in more than one appliance. The booklet has the following introduction:

This little catalog is commended to the thoughtful consideration of every woman who would do all in her power to banish drudgery from her home and enhance its comforts.

Whether the housewife employs electric energy in cooking, lighting, auxiliary heating, or in simplifying the tedious and oftentimes health-impairing routine of housework, she may count herself fortunate indeed in having at her disposal a means that is safe, clean and easily controlled.

The accompanying pages are worthy of careful perusal because they graphically suggest some of the many ways in which electrical appliances can be used in making the modern household all that it should be.

Although industrial conditions are very uncertain at the present time, the cost of many commodities frequently advancing, we shall under no circumstances increase the prices of appliances unless absolutely compelled to do so.

Electrical appliances may be purchased under our pay-as-you-use terms—a small amount with order, the balance in easy monthly payments.

Or a discount of 5 per cent will be allowed if the entire amount accompanies your order.

In conclusion a few pages are devoted to (1) use and care of electrical appliances, (2) how to obtain electric service, (3) about the tests applied by the company to appliances, (4) about lamp purchases, and (5) definitions of electrical terms.

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

AIR-BLAST RECTIFICATION OF HIGH-TENSION CURRENTS

Experiment to Rectify Alternating Currents by Discharge Between a Point and a Plate, the Arc Being Under Influence of Air Blast

THAT a partial rectification of a high-tension alternating current occurs on the passage of a discharge from a point to a plate has been known for many years. However, difficulty has been encountered in attempting to utilize this rectification, particularly

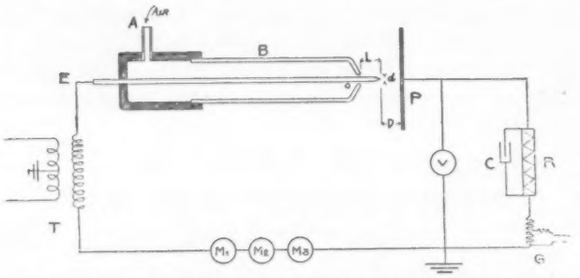


FIG. 1—ARRANGEMENT OF TEST EQUIPMENT USED

if any considerable current flows, as a heavy arc then results which rectifies but little.

In the June, 1917, issue of the *Physical Review* E. R. Wolcott and C. J. Erickson relate the results of an investigation into the effect of a blast of air on this discharge. It was found that complete rectification and smooth operation could be obtained by means of a current of air flowing from the point to the plate under such conditions.

When rectification occurred the discharge was white, rhythmic and snappy, as distinguished from the colored arc which resulted when no air was flowing. Difficulties were encountered when trying to operate at too low voltages, say only a few thousand volts, since a certain voltage is required to jump the air gap. Likewise there is a drop in voltage across the rectifier in actual operation. Satisfactory rectification has been obtained up to 350 kv., and also at frequencies up to 500 cycles per second.

With the point inside of a glass tube the discharge is more snappy, but the tendency to surge is greater. In this case aluminum electrodes seemed preferable, a larger plate was necessary, and a greater air pressure was required. With the point outside of the tube satisfactory results were obtained with iron and brass electrodes.

As the gas pressure increases from zero during the discharge, the rectification increases to a maximum, the value depending upon the setting of the electrodes and the diameter of the gas outlet. A further increase of gas pressure beyond the value which gives maximum rectification produces irregular operation.

In general the wave of the rectified current follows the wave form of the generator, but as a certain voltage is required to start the discharge it does not include the whole half wave produced by the alternator. Furthermore, the rectified wave is more abrupt than the original wave.

The experiments were conducted with the apparatus illustrated in Fig. 1. A pointed metallic electrode E is mounted coaxially within the tube B, which is restricted at one end so that a gas entering at A is blown through the opening O toward the plate P. Rectification occurs when the point is some distance within the tube, at the opening of the tube, or extending some distance outside of the tube as shown. In the first two cases the tube B must be made of some insulating material, as of glass; in the last case it may be of metal.

Mounted for use, this rectifier was connected to one terminal of the secondary of a 2-kw., 40,000-volt transformer T, the other terminal being grounded. The positive current flows from the point to the plate, and no discharge results in the opposite direction when the distance between the point and plate, that between the point and air outlet, the air pressure and the voltage are suitably adjusted.

Connected between the other terminal of the transformer and the ground were three milliammeters. M_1 was of the electrodynamometer type; M_2 was a direct-current instrument of the D'Arsonval permanent field type; M_3 was a hot-wire instrument.

The secondary voltage from the plate P to ground was measured by an electrostatic voltmeter. A General Electric oscillograph was connected directly in the high-tension circuit between the water resistance R and the ground.

The air condenser C consisted of eleven plates 8 ft. by 3 ft. (2.44 m. by 0.91 m.) and 8 in. (20.3 cm.) apart.

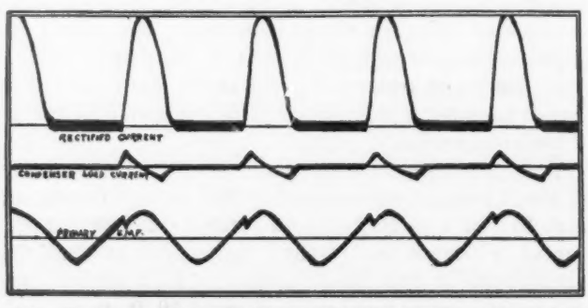


FIG. 2—RECTIFIED CURRENT OBTAINED WITH AIR BLAST RECTIFIER AND LOAD OF 104 MILLIAMP.

Its capacity was 0.00095 mfd. and it was connected in parallel with the water resistance when desired.

The diameter of the plate P should be large enough to prevent a discharge from the point to its edges. In the arrangement here described its diameter was 4 in. (10.16 cm.). The diameter of hole O in the tube B was 0.157 in. (4 mm.). d, the diameter of the metallic

electrode *E*, was 0.0625 in. (1.57 mm.). *L*, the distance between the opening *O* and the point of the electrode *E*, was 0.375 in. (9.54 cm.). *D*, the distance between the plate and the point, was 0.68 in. (1.76 cm.). The frequency of the alternating current was 60 cycles per second.

Generation, Transmission and Distribution

Induction Method of Localizing Faults.—A. G. BLAKE.—A way of localizing faults in underground cable by the use of a receiver attached to a triangular coil of wire, carried parallel to the faulty cable to which a high-frequency supply of electricity is applied.—London *Electrical Review*, June 15, 1917.

Bombay Hydroelectric Power System.—Second installment of article describing the construction features of the Tata Hydroelectric Power Supply Company's system, including an 88,000-hp. (ultimate) generating station and four (ultimate) outgoing transmission circuits. Only two circuits are installed so far. These extend from

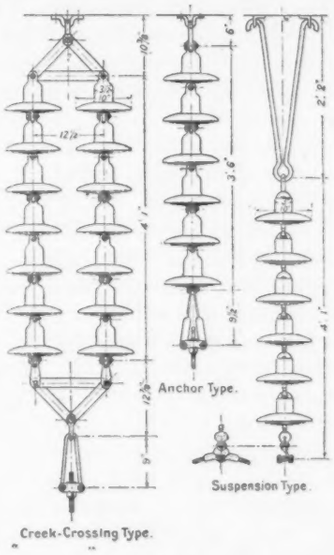


FIG. 3—TYPES OF INSULATORS USED ON BOMBAY SYSTEM

the power house at Khopoli to a receiving station in the island of Bombay. On the way the line has to traverse two tidal creeks, one of which is as much as 10,000 ft. (3048 m.) wide, with a depth of 42 ft. (12.8 m.) at high tide. The conductors for the general line are of seven strand hard-drawn copper wires, each wire having a cross-sectional area of 0.095 sq. in. (0.6 sq. cm.). The maximum resistance allowable is 0.255 ohm per 1000 yd. (0.28 ohm per m.) at 60 deg. Fahr. (15.6 deg. C.). Where the line was taken over the creeks the cables were composed of seven-strand hard-drawn silicon bronze having an area of 0.169 sq. in. (0.109 sq. cm.), and a resistance of 0.514 ohms per mile (0.321 ohms per km.). The conductors are spaced 10 ft. 6 in. (3.2 m.) apart and, in the case of intermediate towers, are arranged delta-fashion on either side of the tower, suspended on six-unit insulators. In the case of anchor towers the conductors are arranged vertically on either side of the tower and are suspended on six-unit insulators. For the creek-crossing towers seven-unit insulators are used, the conductors being arranged vertically over one another on either side. The arrangements of the insulators are shown in Fig. 3. The suspension insulators, which are 10 in. (25.4 cm.) in diameter, are of two types—the metal-hooded type for using vertically on intermediate towers and the link type for using horizontally on the anchor towers. The threaded portions are sherardized and a special non-hygroscopic cement is used for cementing the parts. The ordinary intermediate towers are spaced 500 ft. (152.4 m.) apart, and the creek-crossing towers 1175 ft. (358.1 m.) apart.—London *Engineer*, May 25, 1917.

Traction

High-Speed Three-Phase Locomotives.—P. VEROLE and B. MARSILI.—This article relates to the locomotives supplied to the Italian State Railways. The mechanical construction, electrical equipment, control apparatus and track signaling system are described.—London *Electrician*, June 8, 1917.

Installations, Systems and Appliances

Fuel Saving.—Discussion of the saving in fuel afforded by a summer-time act, plant economies, etc.—London *Electrical Times*, May 24, 1917.

Fuel and Power Supply.—A series of papers by authorities on the transportation and economical utilization of fuels in generating stations. Coke firing and gas firing are the principal subjects discussed.—London *Electrician*, June 15, 1917.

Electrochemistry and Batteries

Developments in Electrochemical Industry.—A. G. HOWE.—Abstract of paper presented before the Canadian Electrical Association on electroplating and abrasive production.—Toronto *Electrical News*, June 15, 1917.

Electrophysics and Magnetism

Electrical Properties of Gases.—J. J. THOMSON.—In this paper the author discusses the relationship between the potential required to produce a spark, the width of the gap and the pressure of the intervening gas. The potential depends solely on the quantity of gas present between the electrodes, so that so long as the product of the gaseous pressure and the width of the gap is constant the potential needed to produce a spark is constant. It does not matter whether the length of the spark gap is small and the pressure great or the distance large and the pressure small. Hence, while in general the potential needed increases with the length of the spark, there are evidently limits beyond which (with the gas at constant pressure) it is more difficult to get a short spark than a long one. With a very short gap it becomes almost impossible to get a discharge at all.—London *Engineering*, June 1, 1917.

Effect of Distributed Capacity in Single-Layer Solenoids.—J. C. HUBBARD.—The author describes a precise method of calculating the distributed capacity of single-layer coils of various dimensions. Among the conclusions reached are the following: The distributed capacity of coils earthed at one end is not much affected by the nature of the core. The distributed capacity of such coils is a minimum and practically numerically equal to the radius of coils of length equal to the diameter, increasing, for example, by 25 per cent when the length of coil is four times its diameter. For the practical purposes of wireless telegraphy it would seem sufficiently accurate to consider the effective capacity of the coil as equal to its radius in centimeters or to $(r/9) \times 10^{-5}$ microfarads.—*Phys. Review*, June, 1917.

Absorption of X-Rays.—Tycho E. Auren.—Relative absorption coefficients of different elements are listed in this paper. From the values obtained the author believes that some simple relation exists between the atomic absorption coefficients and the atomic weights of the elements.—*Phil. Mag.*, June, 1917.

Wires, Wiring and Conduits

Leads for Electric Furnaces.—Arvid Lindström.—(Translated from Teknisk Tidskrift.) The effective resistance of large conductors and their proper arrangement for electric furnace leads, methods of measuring the resistance and inductance of furnace leads and methods of reducing the self-inductance were subjects discussed in this paper. The author pointed out that in those parts of the circuit between the transformer and the furnace where the two leads come near together there is no difficulty in keeping the inductance or the effective resistance within reasonable limits. In such cases, where the common distance is relatively great, considerable can be gained by making the leads of two concentric tubes. The inductance as well as the increase in the resistance will thus be a minimum. In those parts of the circuit, on the other hand, where each pole has a separate path the use of a single group of laminated bars for each lead would, in general, seem unsuitable. This is especially true where large cross-sections are involved. As near as possible to the place where the leads separate, each conductor should be divided into two groups, placed sufficiently far apart with respect to the length. With not too great a current, each of these groups may consist of a single bar whose thickness should not exceed 15 mm. to 20 mm. If the current is great, so that for practical reasons a total thickness of the bars for each group of more than 20 mm. would have to be used, tubes should be used instead of bars. Otherwise the arrangements should be as stated previously. In general, a greater diameter of the tube (and consequently a less thickness of the walls) as well as a greater distance between the groups will give a better result in regard to the inductance as well as to the increased resistance.—*Met. and Chem. Eng'g*, June 15, 1917.

Units, Measurements and Instruments

Application of Oscillograph to Tests of Internal Combustion Engines.—M. Camillerapp.—Description of an interesting application of the Blondel oscillograph. In studying internal-combustion motors it is desirable to record (a) the pressure variations in the cylinder, (b) the period between two explosions, giving the speed of the engine, and (c) the magnitude and duration of the ignition current. By means of oscillographic methods (b) and (c) can be readily followed. A special device has been designed for studying (a). For this purpose a microphone, in electrical connection with an oscillograph, is mounted in the cylinder. In view of the high temperature of the cylinder gases, the latter are only allowed to impinge on a mica disk which in turn communicates its vibrations through a metal needle to the disk in the microphone. In order to minimize the effect of vibrations it is convenient to mount a second microphone back to back with the microphone registering the pressure, so as to be affected by mechanical vibrations only and not by pressure fluctuations. The two microphones are then connected up on the Wheatstone bridge principle so that the vibration effects cancel out. The three factors (a), (b) and (c) can be studied simultaneously and the oscillograph method of attack is expected to throw light on many debatable questions in this field.—Abstract from *Revue Générale d'Electricité*, London *Electrician*, May 25, 1917.

Resistance Bridge.—Oscar de Wette.—Description of a bridge for rapidly testing the resistances of different articles and materials and method of using.—London *Electrician*, June 8, 1917.

Comparing Inductances.—T. Parnell. (Abstract of paper read before Physical Society.) A method of employing an alternating-current bridge for comparing inductances is described.—London *Electrical Review*, June 15, 1917.

Book Reviews

The Nature of Matter and Electricity. An Outline of Modern Views. By Daniel F. Comstock and Leonard T. Troland. New York: D. Van Nostrand Company. 204 pages, illustrated. Price, $2.

This is a book on the modern physics of matter intended for the general reader and written without mathematics. The authors have collaborated by writing different parts of the book. A large number of topics are presented to the reader in semi-popular form. The treatment is descriptive, aided by diagrams and chemical formula groupings, and technical terms have been avoided as far as possible. Part I is divided into eleven chapters on the following topics: Introductory, the ultimate realities, atoms and their behavior, the nature of heat and allied phenomena, the electron and its behavior, electrons, chemical action and light, electrons and magnetism, radio-activity, the structure of the atom, recent discoveries concerning atomic structure and radiation. Part II deals briefly in turn with fifty-six subjects and in a manner somewhat more advanced than that of Part I. The book as a whole is directed to meet the demands of non-technical readers who are interested in recent physical discoveries relating to matter and electricity.

Theory and Calculation of Electric Currents. By Charles P. Steinmetz. New York: McGraw-Hill Book Company, Inc. 362 pages, 133 illustrations. Price, $3.

This is a text-book on electrical engineering partly dealing with direct-current and partly with alternating-current phenomena. The book is divided into three sections. Section I relates to electric conduction in various types of conductor, magnetic reluctivity, hysteresis and mechanical forces. Section II discusses alternating-current waves and means for altering their shape; also means for screening them; instability of circuits in arcs and in reactive apparatus. Section III deals with constant-potential constant-current transformation, constant-potential series operation, load balance, circuits with distributed leakage and oscillating currents. Much new matter is offered in the volume, especially in connection with unstable electric circuits and with the shaping of alternating-current waves. The treatment is essentially mathematical and very incisive. The author's well-known originality makes itself evident throughout. The book is well adapted for use as a text-book for advanced students of electrical engineering or for reference by advanced practitioners.

NEWS OF THE INDUSTRY

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields

ELECTRICAL REQUIREMENTS OF THE EMERGENCY FLEET

National Government Corporation Is Now in the Market for a Large Amount of Electrical Equipment

The Emergency Fleet Corporation of the United States Shipping Board is now in the market for 375 10-kw. generator sets, for 375 electric switchboards and for 375 18-in. electric searchlamps.

In the near future the corporation will also be in the market for the wiring equipment which is to be installed upon the smaller vessels.

Full specifications can be obtained upon application to the corporation, Washington.

NEW ENGLAND N. E. L. A. SECTION HOLDS A WAR CONFERENCE

Meeting in Boston Hears Address Upon the National Coal Situation—Arthur B. Lisle Elected 1918 President

In place of the annual convention of the New England Section of the National Electric Light Association, a war conference of Class A and Class D representatives was held at the Engineers' Club, Boston, Mass., on June 29. President Rollins occupied the chair, and an exhaustive address upon the national coal situation was given by F. C. Wright, vice-president Bangor & Aroostook Railroad and member of the coal committee of the Council of National Defense.

The point was brought out that the public utilities will probably have preferential coal shipments in the coming fall. A general discussion took place as to central stations which are incorporating coal clauses in their power contracts.

In the absence of Secretary T. C. Martin, George B. Muldaur of the N. E. L. A. New York office described the work of the National Committee on Gas and Electric Service at Washington, under George W. Elliott. He also emphasized the fact that through this committee contracts for the supply of electric service to cantonments had been let within two or three days in certain instances through central station co-operation.

The question of compensation to employees on military duty was discussed, but no conclusion was reached, and the matter was referred to the executive committee.

The following officers were elected for the calendar year 1918, taking office in January next: President, Arthur B. Lisle, general manager Narragansett Electric Lighting Company, Providence, R. I.; vice-president, George B. Leland, Stamford, Conn.; treasurer, Bowen Tufts, Boston, Mass.; secretary, Miss O. A. Bursiel, 149 Tremont Street, Boston, Mass.; executive committee, R. W. Rollins, Worcester, Mass.; F. A. Belden, Portsmouth, N. H.; H. L. Olds, Brattleboro, Vt.; C. R. Hayes, Fitchburg, Mass.; S. B. Tuell, Pawtucket, R. I., and E. F. Lawton, Hartford, Conn.

ORGANIZATION OF THE ENGINEERING COUNCIL

Executive Committee Will Co-operate with the Government in Procuring the Services of Engineers to Help in the War

The first meeting of the Engineering Council was held on June 27. This body, as stated in a recent issue of the ELECTRICAL WORLD, is a department of the United Engineering Society.

The council is composed of five members from each of the four founder societies and four from the United Engineering Society.

At the organization meeting the following officers were elected: President, I. N. Hollis; vice-presidents, H. W. Buck and George F. Swain; secretary, Calvert Townley; executive committee, the four officers named, J. Parke Channing and D. S. Jacobus.

The council discussed at length ways and means by which the founder societies through the council may be of use to the nation. The unanimous desire to help the government in the prosecution of this war resulted in a resolution instructing the executive committee to co-operate with the government in procuring the services of engineers, also the appointment of a committee consisting of H. W. Buck, A. M. Greene, Jr., and Edmund B. Kirby to consider the best means of utilizing inventive ability of members of the founders' societies.

NIAGARA FALLS DIVERSION AUTHORIZED ON LAST DAY

Bill Signed by President Just Before Expiration of Old Authorization—$25,000 Appropriated for an Investigation

The Senate and House of Representatives have agreed to the conference report on the bill permitting the present maximum diversion of 20,000 cu. ft. of water on the American side of Niagara Falls. It was signed late on June 30 by President Wilson.

The measure carries an appropriation of $25,000 for an investigation by the War Department.

But for the legislation just enacted, 50,000 hp. would have been cut off on the American side of the falls. Although 20,000 cu. ft. of water per second have been, and are now again, permitted to be diverted, only 19,000 cu. ft. have been used.

The War Department will probably make its investigation through General Black, chief of engineers.

ELECTRIC SERVICE FOR NEW ARMY CANTONMENTS

How Central Station Companies Are Preparing to Meet Requirements of the Camps for Our New Army

Answering inquiries from the ELECTRICAL WORLD, officials of central station companies give the following information in regard to plans for furnishing electric service to the new army cantonments:

DES MOINES, IOWA

From H. W. Garner, commercial manager Des Moines (Ia.) Electric Company:

This company, after negotiation with the officer in charge of cantonment construction at Washington, has secured definite instruction from the War Department to proceed with the work necessary to furnish electricity for the cantonment camp to be located in this city.

The ground to be occupied is known as Camp Dodge and covers a large area which has been used on previous occasions for a concentration camp, having been in use for concentration purposes at the time the troops were prepared for service at the Mexican border.

The camp grounds are about 8 miles (12.8-km.) from the company's nearest high-voltage circuit. We have received definite instruction to proceed with the work and we are beginning the construction of an 8-mile (12.8-km.) transmission line, energy to be transmitted at 13,200 volts and delivered to the camp grounds and to the government at this voltage. The government is to supply and has ordered, it is our understanding, three 350-kw. transformers, stepping down to 2300 volts, which will be used as the distributing voltage throughout the camp grounds.

The estimated lighting, peak load, will be in the neighborhood of 700 kw., in addition to which about 200 hp. or 300 hp. in motors will be required, chiefly for pumping the water supply and sewage disposal—also for refrigeration purposes.

All material required for the construction of the transmission line, with but few exceptions, is on hand or under order.

Contracts for the general construction of the cantonment camp have been awarded to a local contracting firm, Charles Weitz & Sons, who in turn represent the allied contractors of the city, all of whom have pledged their resources and stock in the general construction of the camp equipment. Mr. Weitz will probably undertake, under his contract, the erection of the local distributing circuit and the inside wiring required by the government. It is the understanding that all of this electrical construction work will be handled and can be properly taken care of by the local contractors, and active preparations are now going forward for the handling of the work in this manner.

PETERSBURG, VA.

From J. E. Harvell, superintendent Virginia Railway & Power Company, Petersburg, Va.:

In reference to the cantonment camp to be established near Petersburg, Va., our proposal to the government is to furnish three-phase, 60-cycle, 13,200-volt service, we to extend our lines to approximately the center of the northern line of the camp.

To furnish this service it will be necessary for us to rebuild one of our 4000-volt lines, bringing it up to standard for 13,200 volts, a distance of 3 miles (4.8-km.), and make an extension of this line 2 miles (3.2-km.) to reach the center of the camp. Our source of supply is from the water-power generating station just west of Petersburg in Dinwiddie County, Va., also a 33,000-volt transmission line connecting Petersburg and Richmond power houses together. Our plan is to install three 1000-kva. 33,000-volt to 13,200-volt transformers to supply service to the camp, and replace capacity to Petersburg on account of change in 4000-volt lines to 13,200 volts. The government is asking for service at the camp amounting to 1350 kw., on account of lack of material. The electrical construction inside of the camp proper is being done by the Briggs Electrical Company, Charlottesville, Va.

JUNCTION CITY, KAN.

From W. A. Scothorn, general superintendent Union Light & Power Company, Junction City, Kan.:

The Union Light & Power Company has furnished electrical energy to Fort Riley for several years for interior and exterior lighting, also for power. We have installed a duplicate 2300-volt, three-phase, 60-cycle transmission line from our power house in Junction City to the reservation, about 4 miles (6.4-km.) away. This line has a rating of approximately 600 kw.; also, in addition to this, we have a 33,000-volt transmission line along the right-of-way of our railway, which connects Junction City and Fort Riley, thence along right-of-way of the Manhattan interurban railway, connecting Fort Riley and Manhattan, to a point near the city limits of Manhattan, thence several miles north of Manhattan connecting with the Rockyford hydroelectric plant. The hydroelectric plant is reinforced by a 750-kw. Allis-Chalmers turbine, which is used at low-water stage. The Union Light & Power Company has approximately 1600-kw. station capacity, consisting of three units, two cross-compound units direct-connected and one 750-kw. turbine. This operates over a 33,000-volt transmission line which passes through the maneuver camp. One-half of this cantonment will be supplied from the Union Light & Power Company 2300-volt line and the other half from the 33,000-volt transmission line. The total connection will be 1000 kw. to 1200 kw.

The United States government owns and maintains all lines on the reservation with the exception of all meters, which the Union Light & Power Company will be expected to install. All new construction work in the way of distribution system will be carried on through contractors and will be by the government, it being necessary only for the generating company to furnish step-down transformers for 33,000 volts.

The Fuller Construction Company is general contractor, but any one who desires to get in touch with the details should write to either Captain Herman, Quartermaster, Fort Riley, Kan., or the Fuller Construction Company. They will be able to advise authentically the quantities of material required in this new work. The cantonment structures will be two stories high, and each building will house approximately 250 men. It will be necessary to provide new buildings to take proper care of 70,000 men.

LOUISVILLE, KY.

From L. S. Streng, superintendent electric department Louisville Gas & Electric Company:

We are not yet ready to give details of our plans for furnishing service to the new cantonment. We have not yet had from the government any details as to what its requirements will be. We are now furnishing temporary service for construction and are preparing to extend two of our high-tension feeders to the site of the camp. One of these extensions will be about 2½ miles (4 km.) long and the other about 1½ miles (2.4-km.).

On June 24 and 25 we built a three-phase line about 1½ miles long through the site for the purpose of supplying temporary service. The interior wiring contract has not yet been let.

Greatest Naval Station to be at Hampton Roads

President Wilson by proclamation has taken over the old Jamestown Exposition site on Hampton Roads, about 440 acres, upon which is to be built, at a cost of $2,800,000, what will probably be the greatest United States naval station. A great series of coast artillery batteries, electrically operated, will be constructed, as well as piers, storehouses, oil-storage tanks, training stations, etc. The government takes over all public utility rights and properties on the site.

GREAT INTEREST IN THE BOSTON CREDIT MEETING

Eighteenth Annual Meeting of the National Association Finds Membership of 557—Outlook for Credit Conditions in Future

The eighteenth annual convention of the National Electrical Credit Association was held at the City Club, Boston, Mass., on June 28 and 29. About sixty-five were present, representing all the branches except that of the Pacific Coast. The proceedings were marked by enthusiasm, great interest and an evident desire to cooperate with other branches of the industry.

Sessions were opened on Thursday morning, President Robert Edwards in the chair. When the first convention was held at Boston in 1899 there were 152 members. The present membership is 557. Sixty-four have been added in the last year.

Secretary Frederic P. Vose, referring to the present crisis, said that the electrical industry is likely to be called upon to make great sacrifices, but should take a broad view. Conventions should not be omitted.

OUTLOOK FOR THE FUTURE

At luncheon Norman I. Adams, vice-president Shawmut National Bank, Boston, spoke on "Credit Problems." He pointed out that his hearers' work is rendered difficult owing to the limited capital of many retailers. Since 1914, however, easy profits have rendered the credit situation less troublesome, but credit men should look forward to the reaction that is bound to follow present abnormal conditions. Present prices are artificial, and it behooves the selling concern to watch the debtors' inventories, which should be based on normal, rather than cost, prices of goods. There is no precedent on which to base one's predictions for the future and sudden changes may come.

Guy V. Williams of the Guy V. Williams Company, New York, in a paper advocated the formation of a national reference bureau which should be a court of conciliation and adjustment to handle differences between members and their customers.

The plan was also advocated by V. G. Fullman, secretary Franz Neilson, New York; C. P. Scott, New York; W. T. Pringle, Philadelphia; F. S. Hardy, Boston, and George J. Murphy, Boston. The latter advocated a simple standardized form of accounting for use by the contracting and other branches of the trade, and urged that credit men become broader in their relations with the buyers and do all in their power to improve their customers' credit.

It was voted that the president appoint one member from each association to meet with jobbers' and manufacturers' organizations to formulate a uniform accounting system.

THE CASH DISCOUNT

"What and Why Is a Cash Discount?" was the title of a paper by David Kerr, Lewis Electrical Supply Company, Boston. He held that the cash discount is really a separate contract, and should be lived up to strictly. Slow-paying customers can often be made prompt by encouraging them to collect their own bills promptly and not overstock goods.

Discussion was led by L. M. Creighton, Frank H. Stewart Electric Company, Philadelphia, followed by H. E. Wilkins, Belden Manufacturing Company, Chicago.

The last paper of the day was by D. E. Crane, Macbeth-Evans Glass Company, Pittsburgh, on "Should Interest Be Charged on Overdue Accounts?" Interest charge is enforceable in most states, but it is safest to have it stipulated on the bill, statement or contract. Laxness in making interest charge, after the proper interval for payment, entails the borrowing of money with which to do business, with consequent loss. It is also unfair to burden prompt payers with the results of the remissness of others.

The discussion took place at the Friday morning session and was led by A. E. Case, Western Electric Company, Boston. A test vote resulted in the rejection of the interest-charging plan. It was felt that manufacturers are in a better position than jobbers to charge interest on overdue accounts.

A paper on "Trade Acceptance" was read by J. D. Meek, Indianapolis Electric Supply Company, Indianapolis, Ind. The author said he had used this method to advantage, and had found it better than the open account method so long employed. In the discussion, led by F. S. Hardy of F. S. Hardy & Co., Boston, the opinion was expressed that, owing to the large number of small accounts handled, acceptances are not applicable to the jobbing business. A solution recommended was rendering drafts monthly on the month's purchases.

THE MORAL RISK

R. P. Tracy, Boston, Mass., presented a paper on "The Moral Risk," pointing out that the credit manager must select the material with which he is to work. Brains cannot be supplied the contractor, but his business can be improved in scope and method. More contractors have failed because of too generous credit than otherwise. An important point is for the credit manager to size up the contractor in his place of business. Two of the difficulties mentioned are failure of the contractor to realize sufficient gross because he does not know his overhead (good accounting will solve this problem), and tendency to overstock on slow-moving lines, such as fixtures. Contractors are fair technical men, the speaker said, but poor financiers. The discussion, led by W. W. Harding, Westinghouse Lamp Company, New York, was animated.

The convention closed with a paper on "Municipal Mumps, Their Prevention and Cure," by C. A. Ten Broeck of Philadelphia, in which the credit risk of municipalities was considered. It was urged that definite information be had before accounts are taken, and that the latter be placed with the proper authorities after it is positively known that provision has been made to pay.

W. P. Pringle, Philadelphia, was elected president for the coming year; Benjamin George, Chicago, vice-president, and Frederic P. Vose, Chicago, secretary.

Holland Gift to Doherty Organization

At Fraunces' Tavern, New York, on June 21, representatives of the Dutch stockholders of the Cities Service Company presented to the Doherty Organization a grandfather's clock made at Amsterdam in 1750. Henry L. Doherty accepted it on behalf of the organization.

SURCHARGE OF 10 PER CENT ON MUNCIE (IND.) POWER RATES

Relief Granted by Public Service Commission Applies to Large Consumers—No Opposition Found to Advance

The Indiana Public Service Commission, in the case of the Muncie Electric Company, which had petitioned for authority to add 0.15 mill per kilowatt-hour for every 5-cent increase in cost of coal above $1.90 a ton f.o.b. Muncie, did not grant the full relief asked, although it granted temporary relief.

The order allowed the company to make a temporary surcharge above fixed rates of 10 per cent on bills to large power consumers. The increase will not affect small consumers and will not affect any consumer of electricity for lighting. Small power consumers also are exempt from the surcharge.

The commission held two hearings and some commissioners went to Muncie to ascertain whether opposition existed to the petition. At no point was opposition apparent.

"In this case the commission does not propose to free this company from all the burdens of the present price situation," a commissioner said. "The decision is temporary, extending to Jan. 1, 1918, or until modified by the commission or revoked."

A commissioner declared that if the order did not give all the relief prayed for, certain payments to the American Gas & Electric Company—the parent company—might be curtailed until presents costs decrease.

GOVERNMENT REQUIREMENTS WILL INCREASE THE DEMAND

Application of Companies in Indiana Electric Light Association for Authority to Add Surcharge of 30 Per Cent

Supplementing the article in last week's issue of the ELECTRICAL WORLD on the application of the Indiana companies to the Public Service Commission for authority to add a surcharge of 30 per cent to every bill because of the extraordinary war conditions the substance of the petition is published herewith. It is signed for the association by S. W. Greenland, president, and Thomas Donahue, and says in part:

The average per cent of increase of prevailing prices over normal prices, computed from the reports of a large number of utilities in Indiana, is as follows:

Operating Expense	P.C. of Inc. Prevailing Prices Over Normal
Coal	194
Labor	32.67
Copper	144.86
Miscellaneous supplies	65.91
Taxes	48.41
Equipment	51.14
General operating	45.50

As a temporary expedient for relieving the financial distress caused by the extraordinary prices and to make possible necessary betterments and extensions and prevent curtailment of service, said utilities ask that your commission authorize them to add to each bill a surcharge sufficient to return the difference between prevailing excessive prices and normal prices. Such surcharge is not designed to increase net profits, but is intended only for the purpose above stated, and said petitioners believe that such surcharge required for such purpose will be approximately 30 per cent.

In nearly all cases the requirements of the government will necessitate extensions, improvements and additions to existing plants, and more intensive operations, all of which will result in greatly increased demands upon central power stations. These demands in most cases can be met only by further extensions, betterments and additions to central stations. The money with which to finance these extensions, betterments and additions cannot be obtained as long as the utilities operate at a loss.

Your petitioners are informed that the situation in regard to prices is practically the same as that which confronted the utilities in England after the beginning of war. The governmental agencies determined upon the plan herein suggested as a means of giving relief during the continuance of extraordinary conditions. Said surcharge in England as originally fixed has been increased until it now averages approximately 50 per cent upon each bill.

The following signed the petition:

Albany Water & Light Company
Indiana Utilities Company
Batesville Electric Light & Power Company
Booneville Electric Light & Power Company
Brookville Electric Company
Wabash Valley Electric Co.
Central Indiana Lighting Co.
Danville Light, Heat & Power Company
Indiana General Service Co.
Public Utilities Company
Northern Indiana Gas & Electric Company
Indianapolis Light & Heat Co.
Merchants' Heat & Light Co.
Interstate Public Service Co.
Laporte Gas & Electric Company
Madison Light & Railway Co.
Martinsville Gas & Electric Co.
Montpelier Utilities Company
Mooresville Public Service Co.
Mount Vernon Electric Light & Power Company
Mulberry Light & Power Co.
Muncie Electric Light Company
United Gas & Electric Company
Browne Mills Electric Company
Owensville Light Company
Plymouth Electric Light Co.
Poseyville Light & Power Co.
Princeton Light & Power Co.
United Public Service Company
Sheridan Water, Light & Heat Company
Terre Haute, Indianapolis & Eastern Traction Company
Valparaiso Lighting Company
Union Traction, Light & Power Company
Western Indiana Utility Co.
Oakland City Electric Company

PRESIDENCY OF THE ASSOCIATED MANUFACTURERS

Letter of Robert K. Sheppard Shows His Earnest Insistence Upon the Advantages of a Democratic Organization

In sending to members of the Associated Manufacturers of Electrical Supplies a summary of proceedings of the last annual meeting Charles E. Dustin, the general secretary, transmits also a letter from Robert K. Sheppard. Mr. Dustin refers to the unanimous wish of Mr. Sheppard's associates on the board of governors that he continue as president for another year, but says that it was felt that deference should be given to his wishes, and therefore H. B. Crouse was elected to the presidency. The letter of Mr. Sheppard to Mr. Dustin, dated March 29, but just now made public, says:

The friendliness with which my fellow members on the board of governors have argued that I should continue as president of our association for another year is deeply appreciated.

You know that the prosperity and rapidly growing usefulness of this organization are precious to me. To have been chosen for its first and second president is an evidence of the trust of my comrades for which I am profoundly grateful.

In our association the presidential honor should be passed on from one man to another, each of whom sees human nature through keen and kindly eyes, each of whom has abundant intellectual and physical vigor, each of whom is accustomed to rapid action, each of whom has the courage for swift decisions and the acumen to render only wise ones. Such men will achieve mighty good results in two years. Furthermore, such men will uphold a successor's hands ably and unselfishly so that benefits to the association will multiply as ex-presidents collaborate with their active successors and boards of governors.

Now you see why I believe we should have a new president this year, and why I have asked the board to commandeer Mr. Crouse. All of us want democracy and all of us want a strong leader. In Mr. Crouse we shall have such a leader, wonderfully well known throughout our entire industry and commanding the respect of everybody.

IN STOPPING COAL PANIC CONSUMERS CAN DO THEIR BIT

Secretary of the Interior Lane Shows Importance of Unloading Every Coal Car as Fast as It Is Received

Secretary of the Interior Franklin K. Lane, reviewing the coal situation as reported to him by statisticians of his department, said that the production of coal in the United States last year was the greatest in the history of the country. A new record, however, was set for the first six months of this year.

The limit has not yet been reached, for as railroads are able to work out better the problem of car supply and give greater facilities to mines for transportation coal will reach consumers in steadily increasing quantities. In the early months of 1917, because of railroad congestion and difficulties of transportation, production of bituminous coal fell behind the high mark of January and February a year ago. As a result of the patriotic and earnest endeavor of railroad officials and coal operators and representatives of mine workers who have volunteered services to the federal government, production has been speeded within the last few months and the soft-coal output for May, which exceeded all previous records, was surpassed in June.

Difficulty of distribution, now so great, will be intensified, however, in the winter months. Coal consumers must do their share in working out the problem by unloading every coal car as fast as it is received, and in improving plants so as to utilize to the fullest the heat value of coal that reaches their bins.

MISSOURI UTILITIES WILL ASK HIGHER RATES

Information Compiled for Presentation to Public Service Commission Shows the Serious Problem Now Before Operating Companies

The executive committee of the Missouri Association of Public Utilities met at Kansas City on June 26 with the newly appointed committees on fuel and supplies, and rates and revenues. These committees discussed plans for securing fuel and other necessary materials for the various public utilities of the State. On account of the scarcity of supplies and the tremendous increase in cost of fuel and labor, many Missouri companies are finding it difficult to meet operating expenses. The committee plans to present an application to the Public Service Commission for an increase in rates.

These committees represent practically all utilities in the State, including gas, electric, street railway and water companies, and it is hoped that some arrangement may be made for almost immediate relief. Preliminary data, compiled from sixty different utilities in the State, show that the prices of fuel, oil and labor have increased more than 47 per cent over 1913. Some companies report as much as 338 per cent in prices they have had to pay for coal. When more complete data have been gathered, the committees will hold another meeting at Jefferson City, when the difficulties of the companies will be presented to the commission and relief asked.

TAX ON ELECTRICITY IN WAR REVENUE BILL

Senate Committee Report Retains Telephone and Telegraph Service Levy, but Eliminates House Provision on Electricity—Senate Now to Act

The Senate finance committee has completed its draft of the war revenue tax bill, on which it has been working since May 22, and has reported it to the Senate, retaining the taxes proposed on telephone and telegraph service in the House of Representatives' bill. It is estimated that $7,000,000 in revenue will be raised from these sources.

The Senate draft eliminates the House taxes proposed on electric light, gas and domestic power.

This bill will come up for discussion in the Senate as soon as the food control bill is out of the way, and it is estimated that several weeks' time will be necessary in which to pass it. Almost every industry taxed in the bill has proponents or opponents in the Senate, and it is stated in Washington that there will not only be efforts on the Senate floor to eliminate the $7,000,000 tax proposed on telephone and telegraphic service, but to restore to the Senate measure the proposed House taxes on electric light, gas and domestic power which were eliminated by the Senate committee.

HIGHER ELECTRIC RATES FOR TROY (OHIO) MUNICIPAL PLANT

Coal Costs 112 per Cent More Than Last Year, and Wages Are Higher, Consequently Rate Advance Was Necessary

Frank Burkholder, director of public service of the city of Troy, Ohio, writes to the ELECTRICAL WORLD that on account of increased costs there was no alternative but to raise electric rates. The city is paying 112 per cent more for coal this year than last year, and it was necessary to raise employees' wages.

RULES AND RATES

The rates for light and power are as follows:

Meter rate for lighting current.....7c per 1,000 watts (1 k. w.)
Meter rate for sign lighting.....5½c per 1,000 (1 k. w.)
Meter rate for power.....4c per k. w. for first 100 k. w.
Meter rate for power.....3c per k. w. for next 300 k. w.
Meter rate for power.....2c per k. w. for next 2000 k. w.
All over 2,400 k. w. @ 1½c and an extra 5% off if 15,000 or more used and paid before 10th.

Contract rate for one to four 60 Watt lamps is 40c per month each.

500 Watt Mazda for sidewalk light, each $1.50 per month.

Minimum charge per month for Light, 66c.

Minimum charge per month for Motors, 50c per horse power.

A discount of 10 per cent is given on all bills paid before the 10th of each month.

RULES AND RATES

The rates for light and power are as follows:

Meter rate for lighting current.....8c per 1,000 watts (1 k. w.)
Meter rate for sign lighting.....6½c per 1,000 (1 k. w.)
Meter rate for power.....5c per k. w. for first 100 k. w.
Meter rate for power.....3⅝c per k. w. for next 300 k. w.
Meter rate for power.....2½c per k. w. for next 2000 k. w.
All over 2,400 k. w. @ 1⅞c.

Contract rate for one to four 60 Watt lamps is 50c per month each.

500 Watt Mazda for sidewalk light, each $2.00 per month.

Minimum charge per month for Light, 70c.

Minimum charge per month for Motors, 60c per horse power.

An addition of 10% will be made to all bills not paid by the 10th of each month.

OLD AND NEW "RULES AND RATES" OF TROY (OHIO) MUNICIPAL PLANT

MILITARY EXEMPTION RULES PROMULGATED

Full Text of Section 44 of Regulations Prescribed by the President for Local and District Boards

The extract published herewith is from rules and regulations prescribed by the President for local and district boards under the authority vested in him by the terms of the act of Congress to authorize the President to increase temporarily the military establishment of the United States. This act was approved on May 18, 1917. These rules and regulations may be modified at any time by the President.

Sec. 44. Procedure of district boards in cases where a district board has exclusive original jurisdiction under the terms of said act of Congress.

District boards have the exclusive original jurisdiction in respect of any person whose name has been certified to a district board as called by a local board within its jurisdiction, and who has not been exempted or discharged, to hear and determine all questions or claims for including or excluding or discharging any such person arising under the following provision of said act of Congress authorizing the President to exclude or discharge "persons engaged in industries, including agriculture, found to be necessary to the maintenance of the military establishment or the effective operation of the military forces or the maintenance of national interest during the emergency."

FILING CLAIMS FOR DISCHARGE

A claim for discharge under this provision of said act of Congress may be filed with a district board by or in respect of any person whose name has been certified to the district board by a local board within the jurisdiction of such district board as one called for service by such local board and not exempted or discharged.

Any such claim for discharge must be filed with the district board on a form provided by the provost marshal general and supplied by district boards and local boards for that purpose on or before the fifth day after the mailing by a local board of notice to such person that his name has been certified to such district board as called for service and not exempted or discharged.

The statement on the registration card of any such person that exemption or discharge is claimed shall not be construed or considered as the presentation of a claim for discharge.

Such a claim may be filed by or in respect of any such person on any of the following grounds:

1. That he is actually engaged in a particular designated industrial enterprise or in a particular designated agricultural enterprise necessary to the maintenance of the military establishment; that his continuance therein is necessary to the maintenance thereof, and that he cannot be replaced by another person without direct substantial material loss and detriment to the adequate and effective operation of the enterprise in which he is engaged.

2. That he is actually engaged in a particular designated industrial enterprise or in a particular designated agricultural enterprise necessary to the effective operation of the military forces; that his continuance therein is necessary to the maintenance thereof, and that he cannot be replaced by another person without direct substantial material loss and detriment to the adequate and effective operation of the enterprise in which he is engaged.

3. That he is actually engaged in a particular designated industrial enterprise or in a particular designated agricultural enterprise necessary to the maintenance of national interest during the emergency; that his continuance therein is necessary to the maintenance thereof, and that he cannot be replaced by another person without direct substantial material loss and detriment to the adequate and effective operation of the enterprise in which he is engaged.

The word "necessary" as used in said act of Congress shall be construed and held to mean that the discontinuance of or serious interruption in the particular designated industrial enterprise or the particular designated agricultural enterprise in which the person is engaged would result in substantial material loss and detriment to the adequate and effective maintenance of the military establishment or the adequate and effective operation of the military forces or the maintenance of national interest during the emergency.

CONSTRUING THE WORD "NECESSARY"

The word "necessary" as used in the phrase "that his continuance therein is necessary to the maintenance thereof" in these regulations shall be construed and held to mean that the withdrawal of the labor or service of such person would directly result in substantial material loss and detriment to the adequate and effective operation of the particular designated industrial enterprise or particular designated agricultural enterprise in which such person is engaged.

Affidavits in support of or in opposition to any such claim shall be filed within five days after the filing of a claim for discharge by or in respect of any such person.

The words of the act "persons engaged in industries, including agriculture," shall not be construed and held to mean that a person engaged in a particular industrial enterprise or particular agricultural enterprise is entitled to be discharged by reason of the fact that such class of industry taken as a whole, or agriculture taken in its entirety, is necessary to the maintenance of the military establishment or the effective operation of the military forces or the maintenance of national interest during the emergency.

In order to substantiate any such claim the evidence submitted must establish that the particular designated industrial enterprise or particular designated agricultural enterprise is necessary to the maintenance of the military establishment or the effective operation of the military forces or the maintenance of national interest during the emergency.

The evidence must also establish, even if the particular industrial enterprise or particular agricultural enterprise is found necessary for one of the above purposes, that the continuance of such person therein is necessary to the maintenance thereof, and that he cannot be replaced by another person without direct substantial material loss and detriment to the adequate and effective operation of the particular industrial enterprise or particular agricultural enterprise in which he is engaged.

In order to assist in securing uniformity in decision and practice of district boards and to provide for co-operation and co-ordination between the necessities of the military establishment, the military forces and national interest, and the industries, including agricultural, found to be necessary to the maintenance of the military establishment or the effective operation of the military forces or the maintenance of national interest during the war, the President may, however, in his discretion, from time to time ascertain and determine which industries, including any agricultural industries, or classes of industries, including agricultural industries, are necessary for the purposes specified in said act of Congress, and may certify to the respective district boards, with the force and effect of regulations prescribed by the President in accordance with the terms of said act of Congress, that a designated industry, including any agricultural industry, or a designated class of industrial or agricultural enterprise, is or are necessary for one of the purposes specified in said act of Congress.

INDUSTRIAL AND AGRICULTURAL ENTERPRISES

In the event that any industrial enterprise or agricultural enterprise is included among those so certified, the evidence submitted to the district board must nevertheless establish the facts that the continuance therein of the person by whom or in respect of whom the claim is made is necessary to the maintenance thereof, and that he cannot be replaced by another person without direct substantial material loss and detriment to the adequate and effective operation of the particular industrial enterprise or particular agricultural enterprise in which he is engaged.

It shall be the duty of each district board to ascertain by its own methods the existing conditions in industries that may be claimed to be necessary within the meaning of the

act of Congress and these regulations and the agricultural conditions as a whole within its jurisdiction as they may be affected by the drafting into the military service of the men called by the respective local boards within its jurisdiction.

It shall also be the duty of each district board to ascertain as near as may be the labor supply available for such necessary industries and for agriculture outside of the men called for military service, and to take into consideration all such facts in determining such claims, and the effect of the efforts of governmental agencies to mobilize and to make such labor more efficient.

If, in the opinion of the district board, the direct substantial material loss to any such industrial or agricultural enterprise outweighs the loss that would result from the failure to obtain the military service of any such person, a certificate of discharge may be issued to him subject to the conditions of Section 45 hereof.

Within five days after the closing of proofs in any such case the district board shall decide in favor of or against any such claim.

EXPORT TRADE CONFERENCE HELD AT SPRINGFIELD, MASS.

Remarkable Opportunity Before American Manufacturers to Develop Lasting Trade and Thus Stabilize Their Operations

A conference lasting one week, and devoted entirely to the problems of export trade, closed at Springfield, Mass., on June 30. The keynote was the remarkable opportunity now before American manufacturers in South America, Europe, the Far East, and other foreign quarters of the globe, to develop lasting trade capable of affording continuity of output regardless of business depressions in this country. The consensus of opinion was that the best men should be drawn upon to build up the foreign field. Emphasis was laid upon the vital necessity of completely fulfilling specifications and promises to foreign purchasers, including shipments on dates agreed upon, and packing as required by foreign buyers. Much time was also given to reviewing credit facilities available through enterprising American banks. Among the speakers were J. W. Brooks, vice-president Pass & Seymour, Solvay, N. Y., "Starting In on Export"; Fred S. Phillips, export manager American Ever Ready Works, Long Island City, N. Y., "The Inside of Exporting"; and A. W. Gilbert, Chapman Valve Manufacturing Company, Indian Orchard, Mass., "Metal Fittings in Overseas Markets."

EXPORT TRADE NEEDS OF THE UNITED STATES

Various points brought out in the conference may be touched upon. The United States needs export trade because it is the greatest producing nation and must have foreign outlets for surplus products or suffer the evils of glutted markets at home and the detriment of capital and labor alike. From 1913 to 1916 total exports of the country increased from $2,484,018,292 to $5,481,423,589. Total value of firearms, explosives, etc., exported in 1916 was $757,700,475. Manufacturing is not likely to develop rapidly in South America at present because of short coal supply, but hydroelectric power will come into play in the future. Exports to South America increased from $186,678,122 in 1913 to $266,895,330 in 1916. It is expected that alliances during the war will be effective for a considerable period in trade relations after the conflict. A powerful United States merchant marine is likely to be a feature in future years. For a long time this country will probably be a chief source of funds for development enterprises in the world.

Patience is necessary in developing profitable foreign trade. Mushroom jobbers should be avoided. The government should foster co-operative efforts by competitive manufacturers seeking foreign outlets. We should freely accord long-time credits to foreign buyers. Foreign trade agencies are the eyes of export business. The trade balance of the United States in 1916 was $2,080,000,000, compared with $435,000,000 in 1914. Relief from restrictive legislation is needed. Co-operation and standardization are also needed in American manufacturing plants to meet foreign competition, including uniform system cost accounting where possible. Much would be gained by drafting successful business men for governmental positions. One should tell even one's competitor about foreign credit risks. To have one's bank give its acceptance on a draft against a foreign buyer, with the corresponding development of the acceptance market, is a growing satisfactory means of financing foreign shipments; this increases capital turnover. Personal travel is most important in developing trade. Foreign buyers are usually more accurate and particular than those in domestic trade. Manufacturers should not seek foreign trade which cannot be consistently carried at all times. Standards of business honesty are generally equal to those in vogue in this country. An attractive field for the loose-leaf catalog exists, the catalog being printed in the language of the country concerned, and complete in ordering and shipping instructions, with typical examples. The field in South America applies particularly to capital of $100,000 and over, that for small capital being less faforable at present. Closer intercourse is most important with South America, including study of people and countries. American tools can be sold abroad, even in competitive countries, on the basis of superior worth, and at higher prices than apply to local competitive products. Shorter working days and higher-cost labor are expected in Europe as a result of the war.

ILLUMINATING ENGINEERING CORRESPONDENCE CONVENTION

Substitute Plan for Annual Convention—Dues Remitted for Members Who Enter the Military or Naval Service

At the last meeting of the Council of the Illuminating Engineering Society it was decided that any member or associate member in good standing when entering the military or naval service of the United States or any of its allies may upon request before Oct. 1, 1917, or if called out after that date, have his name retained upon the membership roll, without payment of dues, during the year ending Sept. 30, 1918. The council voted to invest $1,000 in Liberty bonds.

In lieu of the regular annual convention, which has been abandoned, the society will hold a "correspondence convention." Papers prepared for this annual convention will be circulated among interested members in advance of publication in the *Transactions*, and written discussions may be submitted for publication. In this way the value of the papers and discussions will not be lessened because of cancellation of the convention.

A. I. E. E. DISCUSSES CABLE AND INSULATOR PROBLEMS

Forcing of Cables Suggested to Offset High Prices of Copper—Fused Quartz Insulators Receive Consideration

Several well-known engineers took part in the discussion of problems connected with cable operation at the recent meeting of the A. I. E. E. in New York. Among them were W. I. Middleton, Pittsburgh Wire & Cable Company; Philip Torchio, New York Edison Company; H. R. Woodrow, New York Edison Company; J. B. Whitehead, Johns Hopkins University; D. W. Roper, Commonwealth Edison Company; J. F. Bang, Pennsylvania Water & Power Company; W. S. Clark, General Electric Company; John L. Harper, Hydraulic Power Company, Niagara Falls; E. B. Meyer, Public Service Electric Company of New Jersey; C. A. Adams, Massachusetts Institute of Technology, and C. N. Rakestraw, Cleveland Electric Illuminating Company.

Cable Questions Discussed

One of the most important points brought out was that the prevailing high prices of copper can be combated to a great extent by forcing the rating of cables. In doing this particular attention should be given to the construction of the ducts, so that they will not impede heat radiation. The temperature gradient, Professor Whitehead pointed out, is the least in ducts with the largest radiating surface. If dissipation curves can be laid out for different soil conditions and different numbers of ducts and dielectric losses of cables can be obtained, a great step can be made toward standardizing cable ratings.

While operating cables under practically submerged conditions, as suggested by Mr. Harper in the paper that was abstracted in the June 30 issue of the Electrical World, may substantially increase their ratings, there are some objections to it. For instance, if the cables have to be repaired when the ducts are filled with water the ducts have to be pumped out before anything can be done. In addition, lead sheaths will corrode quickly when water circulating past them carries very much air. Furthermore, the evil effects of electrolysis may be augmented if cables are submerged in water.

Conditions which affect cable failure were also brought out. In this connection Mr. Middleton pointed out that many cables are being used under conditions for which they were not designed, and as a result the performance obtained therewith is not what could be expected. He contended that the personal element in making cable joints is more important than the materials used and that no ready-made joint known to him is as desirable as a hand-made joint. Since the difference between the electrostatic capacities of cables and joints may have some effect on joint failure, it was advised that a study be made along this line.

Owing to the disintegration of cable insulation when cables have been in the ground a long while, the dielectric performance may be considerably different from what it was when the cable was new. Furthermore, allowance must be made for radiating additional heat. Ionization may also be a cause of cable failure, Professor Adams pointed out, where the rubber or insulating material does not completely fill the interstices between strands. This action is aggravated by terminal conditions which may set up voltage surges. Joint trouble may be caused by the shrinkage of compound in the middle of the joint due to temperature changes, since the inner core of insulating compounds is the last to cool.

A warning was sounded against generalizing the conclusions drawn from tests, as such conclusions are subject to misconstruction. Mr. Torchio said that his experience indicated that "hot spots" are not the most frequent source of cable trouble. In one case where extra high-voltage cable was employed the wrapping of the insulation had a great effect. Reference was made to the high-tension joint described in the April 15, 1916, issue of the Electrical World, attention being called to the fact that 290 of the joints have been used on 25,000-volt circuits for three years without failure.

Insulator Problems

In the discussion of insulator problems the following took part: J. P. Clark, Stanford University; E. E. F. Creighton, General Electric Company; E. M. Hewlett, General Electric Company; Percy Thomas, New York; J. B. Taylor, New York; C. F. Harding, Purdue University; John T. Barron, Public Service Electric Company, New Jersey, and A. O. Austin, Ohio Insulator Company.

In commenting on the possibilities of fused-quartz insulators, suggested in Mr. Peaslee's paper (abstracted in the June 30 issue of the Electrical World), the point was brought out that they will withstand heavy arcing and will not crack when cold water is thrown over them when the material is heated. Mr. Clark pointed out, however, that they may become brittle at 150 deg. to 200 deg. Fahr. (65.6 deg. to 93.3 deg. C.). Mr. Taylor suggested that the properties of fused quartz along different optic axes be studied in order that the effect of different orientations of the crystals on dielectric strength may be determined.

The advantages of one-part, two-part and three-part insulators were brought out. If the cracking of multiple-part insulators does not seriously affect their breakdown value, it is not so important electrically as mechanically, Mr. Thomas pointed out, as an insulator which fails mechanically may drop a line and interrupt service in this manner. The trouble with moisture absorption is not so liable to be experienced with one-part insulators, Mr. Hewlett declared, as with multiple-part insulators joined by the cement, since the latter acts as a sort of sponge. Mr. Barron contended that if one member of a two-part insulator is destroyed, the remaining parts will not withstand the operating voltage like a three-part insulator would when only one member is destroyed. Mr. Austin said, however, that smaller strains exist in two-part insulators than in three-part insulators, so that the liability of failure is not so great.

The coloring of the glaze on insulators is not a definite indication of the porosity or vitrification temperature, Dr. Creighton contended, as it may be changed by oxidation or kiln conditions. Oscillation tests can be depended upon to a greater extent, he declared. According to Professor Harding some insulators which were soaked in water twenty-four hours showed a higher puncture voltage than when dry. This was attributed to redistribution of the dielectric flux due to the condenser action between the absorbed films of water.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities.

Joint Wood Pole-Line Construction in Connecticut.—Rules and specifications governing joint wood pole-line construction have been put into effect by the Connecticut Public Utilities Commission. A committee had been appointed previously consisting of T. N. Bradshaw, Southern New England Telephone Company; C. M. Yale, Hartford Electric Light Company; R. E. Chetwood, Western Union Telegraph Company; H. M. Gould, Connecticut Company; D. B. Neth, United Electric Light & Water Company, and J. F. Skirrow, Postal Telegraph Company. This committee, representing various users of pole lines, worked in conjunction with John F. Trumbull and Archer E. Knowlton, commission engineers. The rules are intended to amplify, systematize, and hence supplant those on pages 133-163 of the 1911 report of the committee on overhead line construction of the National Electric Light Association, which formerly had been tacitly recognized by the commission.

New York Edison Rate Decision.—Commenting on the course of the New York Edison Company in accepting the decision of the Public Service Commission for the First District in the matter of a further reduction of rates, the commission expresses its gratification that the company has decided to put promptly into effect the 7-cent rate and corresponding reductions throughout its scale of charges, rather than exercise its right to restore the 8-cent rate in force prior to last January. By this action on the part of the board of directors of the company there is assured a total saving within the present year to consumers of electric energy in Manhattan and the Bronx amounting to at least $1,750,000, of which at least $750,000 will be the result of the reduction effective on July 1. The commission is of the opinion that the request with which the company couples its acceptance is reasonable and in the public interest. By the original agreement the company had reserved the right, if it thought conditions so warranted, to restore the 8-cent rate on July 1, 1917, by its own action, subject of course to the right of the commission to conduct proceedings to compel reduction. In acting upon the commission's decision the company asks that this right be considered as given also as of Jan. 1, 1918. This alternative of restoration, the company says, it would not exercise except by virtue of unmistakable emergency. The consent of the commission is accordingly given to an entry in the minutes which will modify the agreement of Nov. 2, 1916, so as to give the company the same right on Jan. 1, 1918, which it would have had on July 1, 1917. The company's notification of intent to place the 7-cent rate and corresponding reductions throughout in scale in effect as of July 1, 1917, is filed as a part of the record in this proceeding. On Jan. 1, as was the case on July 1, the commission will be able, should it see fit, to act promptly if the company shall undertake to restore a rate deemed unwarrantedly high.

Surrendering Franchises in Indiana.—The time limit under the Indiana public utility law for voluntary surrender of franchises by utilities expired on July 1, and many utilities took advantage of the "indeterminate state permit" possibilities of the law and filed notices with the commission. Some of the larger systems have surrendered franchises for their companies recently. Other utilities, however, apparently are not availing themselves of the privilege and will continue to operate under their old city and town franchises until those expire. The Public Service Commission has formally discussed the question of interpreting the status of utility companies in case they do not surrender their franchises. Chairman E. I. Lewis says that the commission will make no formal statement and will take no position regarding such questions as may arise hereafter. Legal phases of this part of the law will be dealt with whenever they arise and no general rule is to be applied at this time.

Lease of Philadelphia Conduit Approved.—The Pennsylvania Public Service Commission has approved a lease by the Philadelphia Electric Company of the conduit system of the Keystone Telephone Company at Philadelphia, at 4 cents per duct-foot. This ruling reverses a former commission decision in September, 1916, refusing the application on the ground that the price stated was too high. The commission says: "The commission has approved the lease, subject to the condition that it did not pass upon or express an opinion as to the valuation placed on the conduits by the Keystone Telephone Company in arriving at the rental to be paid for the use of the ducts by the Philadelphia Electric Company." The minimum rental will begin at $25,000 a year and increase $12,500 a year until $100,000 has been reached, after which this amount will continue to be the minimum. The maximum rental price is to be $240,000. The lease covers twenty-one years, making the minimum rental for the last fourteen years $100,000. The electric company has the option of extending the contract for a period of fifteen years at the same minimum rental, and if desired, to claim a still further extension to 1960. In the last period the minimum rental is to be $125,000. The lease grants the electric company the right to take over conduits it uses at the end of the agreement, at a price satisfactory to both parties. The electric company proposes to use about 60 per cent of the present available space. The system represents an investment stated to be about $4,000,000.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies.

Who Should Bear Expense for Meter Boxes.—That water consumers not having basements or cellars suitable for meters installed by the utility may be required to provide suitable meter boxes or vaults at their own expense is held in the Wisconsin case of Wood vs. La Farge (P. U. R., 1917 A, 763).

Death Caused by Line Broken by an Owl.—Where plaintiff's husband was electrocuted by broken transmission line, a requested instruction to find for defendant if the condition was caused by an owl flying against the wires was properly refused where there was evidence that even in such a case a circuit breaker would have prevented the injury, the Court of Civil Appeals of Texas held (194 S. W. 1016) in Abilene Gas & Electric Company versus Thomas. In an action to recover for death by electrocution, an instruction that defendant's failure to turn off the current under certain circumstances constituted negligence is erroneous, since the trial court should not instruct whether certain facts constitute negligence.

Proximate or Remote Injuries from Dam.—In the case of Wissmath Packing Company vs. Mississippi River Power Company (162 N. W. 846) it appeared that defendant constructed the Keokuk Dam across the Mississippi River under authority of an act of Congress which imposed upon it the obligation to make compensation to all persons whose property might be taken or damaged by its construction, in accordance with the laws of the state where such property might be situated. The owner of a packing plant near the river sued the power company, claiming that, after execution sale of the plant on foreclosure of mortgages thereon, the value of the plant was depreciated by flooding of its cellars, due to the rising of the river, and that this made it impossible to raise money to redeem the plant. Judge Evans, in giving the opinion of the Iowa Supreme Court, said: "We hold that the damages, if any, which accrued against the defendant were those only which arose proximately out of the injury to the plant by the flooding of the cellar, whether such injury was temporary or permanent; that there was no separate and divisible injury to the right of redemption as distinguished from the injury to the property, and to the ownership thereof, and to the right of possession; that the damages claimed for alleged interference with the contract and the resulting loss of the property through the failure to redeem were remote and speculative and not proximate. These conclusions have the support of many authorities."

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

The Jovian Benefit Plan.—The Jovian central office has issued a brochure covering every phase of the accident and health insurance which the order is now furnishing members. The booklet was written by Mercury Ell C. Bennett. It may be obtained upon request to the Jovian Order, Syndicate Trust Building, St. Louis.

Shop Lighting Code in Wisconsin.—The Industrial Commission of Wisconsin has formed a committee on factory lighting legislation to pass on the desirability of redrafting its orders on shop lighting, issued on Jan. 20, 1913, and if found necessary, to draft a new code and recommend it to the commission for adoption. The committee is composed of gas and electric interests, jobbers, manufacturers and representatives of the medical profession. At the first meeting on June 29 it was decided that the present orders were vague and inadequate and that they should be revised. A sub-committee was appointed to draft a tentative code for discussion at the next committee meeting.

Competition Ends at Galesburg, Ill.—Weinburg Brothers, who operated the Galesburg Artificial Ice Company and the Galesburg Manufacturing Company and conducted an electricity supply and steam-heating business, have sold their entire interests to the Galesburg Railway & Lighting Company, a part of the Illinois Traction System. The central station company thus eliminates electric and steam-heating competition, acquires a desirable lake property which will aid in solving its water problem and puts itself into the artificial-ice business. The purchased plant contained 1000 hp. in boilers, 75 kw. in generating equipment, and machinery rated at 70 tons. It is planned to shut down the old plant in the summer season and to take exhaust steam from the company's large non-condensing station through a 4000-ft. main to the old Weinburg plant to make ice. The consideration was $150,000.

Pennsylvania Hotel to Have Westinghouse Equipment.—The Westinghouse Electric & Manufacturing Company has been awarded the contract for furnishing the electrical equipment for the new Pennsylvania Hotel now being erected at Seventh Avenue and Thirty-third Street, New York. This building, when it is completed, will be the largest hotel in the world, containing 2200 rooms, each with a bath. The hotel is being erected by the Pennsylvania Railroad and will be operated under the Statler management. The electrical equipment consists of forty-four ventilating motors with a total capacity of over 800 hp.; seven pump motors with capacity of more than 200 hp., and an additional number of motors for refrigerating machinery. The contract also includes three 500-kw. rotary converters, transformers and switching equipment, and six 250-kva. transformers for the substation, to which alternating current will be supplied from the Pennsylvania Railroad power house. The heating and ventilating contract was awarded to Baker, Smith & Company; plumbing to the W. J. Connell Company; electrical work to L. K. Comstock & Company; refrigerating to the Shipley Construction & Supply Company; general contracting to the George Fuller Company. The hotel was designed by McKim, Meade & White, architects; Tenney & Ohmes are the heating and ventilating engineers, and the electrical engineer is Charles E. Knox. All of these are of New York.

Electrical Development in Japan.—A Japanese supplement issued by the New York *Evening Post* on June 30 contains an article by Chugo Ohira showing that war has stimulated growth of electrical enterprises in that country. This says that in December, 1916, the number of electrical enterprises was estimated at 642, with a capital of 660,000,000 yen and 900,000 kw. rating. With the private plant capacity the total would be about 1,150,000 kw. Hydroelectric power has increased greatly and now comprises about 80 per cent of the total.

Oil Shortage in California.—In a hearing before the California Railroad Commission last week W. R. Scott, general manager Southern Pacific Railroad, stated that the fuel-oil shortage was such that unless there is speedy relief train service must be curtailed. Considering all oil storage and sources of relief now apparent, ninety days is the maximum period for which operation on present basis is possible. At present the company consumes 44,000 barrels of oil per week, of which 18,000 barrels are being purchased in the open market. Converting divisions to coal consumption has been considered and abandoned as unwarranted by the visible supply of coal. Another very serious problem is the freight congestion over the mountain divisions, particularly the Tehachapi Pass, where a single-track line must accommodate two transcontinental systems. The congestion is due partly to increased business and partly to absence of bottoms for transcontinental shipments via the canal route. Under these conditions speedy electrification is being suggested. The cost of electrification is believed to be less than that of double-tracking, which would be postponed by the increase of capacity due to electrification. If the railroad can adapt requirements so as to use standard electrical equipment, it is believed that as an emergency measure manufacturers could supply locomotives and at least the most critical mountain pass could be operated as an electrified division within ten months. If this is found feasible, it would at the same time relieve the freight congestion and release for uses that cannot employ hydroelectric energy the oil now inefficiently used in steam locomotives.

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 47 of this number.

Electrical League of Cleveland.—The last meeting of the season for the Electrical League of Cleveland was held on June 28. The final reports of the Red Cross campaign were given.

Brooklyn Edison Section, N. E. L. A.—At a recent meeting of the executive committee of the Brooklyn company section of the N. E. L. A., G. J. Leibman was elected chairman of the section to succeed C. R. Knapp, deceased. R. J. McDonald is the new secretary of the section.

Empire State Gas and Electric Association.—The second meeting of the year of the Empire State, Gas and Electric Association will be held at the Hotel Iroquois, Buffalo, on July 13, under the direction of the electric production committee. The principal subjects for discussion will be "Power-House Organization," "Hours of Labor" and "Wages and Bonuses."

Illinois Electrical Contractors' Association.—At the convention of the Illinois Electrical Contractors' Association, June 22 and 23, the following officers were re-elected: President, J. M. Pierce, Chicago; vice-president, J. C. Marron, Rock Island; secretary, L. B. Van Nuys, Peoria; directors, M. N. Blumenthal, Chicago; J. M. Crawley, Peoria, and E. R. Pendergast, Rockford.

New York Electrical Contractors' Association.—The best means of boosting the trade during the war was one of the subjects discussed at the meeting of the New York Electrical Contractors' Association, June 12. W. L. Goodwin, New York, who represents the allied electrical interests of America, urged every contractor to assist the government in the present crisis. J. J. O'Leary of Buffalo presided.

Portland Section, A. I. E. E.—Among the papers presented at a recent meeting of the Portland (Ore.) Section of the A. I. E. E. are the following: "Description of Chart to Determine Proper Sag for Stringing Aerial Wires," by H. H. Schoolfield; "Determination of Efficient Ground Connections for Distribution Systems," by W. C. Heston, and "Reclamation Load on North Coast Power Company's Line," R. M. Boykin.

N. E. L. A. Geographic Sections.—In line with the action taken by the national body, the New England Section of the N. E. L. A. decided at its last executive meeting to abandon the annual meeting scheduled to take place at New London, Conn., Sept. 11 to 14. Plans have been laid for a meeting at Boston to discuss the problems created by the war, but the date has not yet been determined. Similar action has also been decided upon for the Iowa, Michigan and Pennsylvania sections.

H. W. BUCK

Harold W. Buck, vice-president of the engineering firm of Blackwell & Buck of New York City and retiring president of the American Institute of Electrical Engineers, was tendered a dinner by the board of managers of the Institute on June 21 in appreciation of his efforts in directing the activities of the A. I. E. E. during the past year. Mr. Buck, who was born on May 7, 1873, received his academic education at Yale, and at the age of twenty-two he was graduated from Columbia University with the degree of electrical engineer. He was first employed by the General Electric Company in the student department at Schenectady. He left Schenectady in 1900 to become electrical engineer of the Niagara Falls Power Company and its allied interests, continuing in that capacity until 1908, when he moved to New York to enter the firm of Viele, Blackwell & Buck. Besides designing a three-phase motor operating by static induction, Mr. Buck has done considerable research and experimental work, taking out many patents. In co-operation with E. M. Hewlett he developed the suspension insulator system now so widely used on high-tension transmission lines. With two associates he patented a process for the manufacture of corundum in the electric furnace, which process was developed and placed in commercial operation at Niagara Falls.

Paul Rambo, chief clerk at the Pomeroy office of the Pacific Power & Light Company, has been appointed acting district manager of the same office, vice R. F. Dean, who has joined the officers' reserve corps.

Roy F. Dean, district manager at the Pomeroy office of the Pacific Power & Light Company, has been appointed a second lieutenant in the engineers' section of the officers' reserve corps and is now at the training camp at the Presidio.

Prof. Vladimir Karapetoff of Cornell University is spending this summer with the Commonwealth Edison Company of Chicago. He is at present engaged, under Vice-president John F. Gilchrist on some problems in connection with coal supply and purchase.

Men of the Industry

Changes in Personnel and Position— Biographical Notes

John P. Boyd has assumed his duties as superintendent of the Fremont office of the Ohio Light & Power Company, succeeding B. J. Shockley.

H. C. Carroll, chief engineer for the Muncie (Ind.) Electric Light Company, has resigned to accept a position with the Indianapolis Light & Power Company.

W. P. Guinan, new-business manager of the Danbury (Conn.) & Bethel Gas & Electric Light Company, has been appointed to the local committee on food supply, a branch of the State Council of Defense.

Major Ralph D. Mershon, engineer officers' reserve corps, is relieved from his present duties and will report by letter to the chairman Naval Consulting Board in Washington, for duty in connection with military research, retaining station in New York, N. Y. Mr. Mershon is a past-president of the American Institute of Electrical Engineers.

W. P. Sidley, vice-president and general counsel of the Western Electric Company and a member of the executive committee of the National War Council of the Young Men's Christian Associations of the United States, has been placed in charge of the Y. M. C. A. concentration camps' activities for the central department, which includes the fifteen States lying between Kentucky and Canada, as well as Pennsylvania and Colorado. His appointment to this position follows several years' service as president of the Chicago Y. M. C. A. He is devoting the greater part of his time to this work.

J. E. Davidson, who resigned from the vice-presidency and general managership of the Pacific Power & Light Company, Portland, Ore., some six months ago to become connected with the Electric Bond & Share Company, has been appointed vice-president and general manager of the Nebraska Power Company, Omaha, Neb. This company has recently acquired the plant and property of the Omaha Electric Light & Power Company. Before going to Portland Mr. Davidson was president and manager of the Consolidated Lighting Company of Montpelier, Vt. Both in New England and the Northwest he was very prominent in N. E. L. A. activities, having been chairman of the New England Section in 1910-1911 and president of the Northwest Electric Association in 1911-1912, besides having been elected a member of the executive committee of the N. E. L. A. at the San Francisco convention in 1915.

A. B. LISLE

Arthur B. Lisle, general manager of the Narragansett Electric Lighting Company of Providence, R. I., was elected president of the New England Section of the National Electric Light Association at its one-day session in Boston on Friday, June 29. Mr. Lisle has been on the executive committee of the New England Section for some years and was at one time its vice-president. He has been with the Narragansett Electric Lighting Company almost continuously since 1893, having been general manager since February, 1908. Mr. Lisle is also interested in the Putnam Light & Power Company of Putnam, Conn., having been its treasurer for the last ten years. He is also president and treasurer of the Central Connecticut Power & Light Company. Mr. Lisle has been an associate member of the American Institute of Electrical Engineers for approximately twenty years.

E. M. Plummer, formerly chief engineer of the Atlantic City (N. J.) Electric Company, has been placed in charge of the new Windsor station belonging to the American Gas & Electric Company.

A. L. Platt has been promoted from engineer of the power station of the Canton (Ohio) Electric Company to succeed E. M. Plummer as chief engineer of the plant of the Atlantic City Electric Company.

Calvert Townley, assistant to the president of the Westinghouse Electric & Manufacturing Company, has been appointed secretary of the newly formed Engineering Council, a department of the United Engineering Society formed for the purpose of speaking authoritatively for all member societies on public questions of a common interest to engineers.

Howard A. Holmes has returned to the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, as assistant electrical engineer. Mr. Holmes was formerly connected with that company in various capacities until about eight years ago. He was employed at the aeronautic station of the Pensacola navy yard before returning to Youngstown.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

STANDARD PACKAGE PLAN BECOMING MORE POPULAR

Now Being Used by Distributers of Certain Kinds of Merchandise with Evidence of a Broadening Application Soon

Fundamentally the reason why discounts are given to the trade is that purchases are made in large quantities. Different branches of the trade receive different discounts for the same fundamental reason. In other words, the idea of discounts and their size relative to the different parts of an industry arose from the economic principle that it costs less to sell goods in proportion to the quantity sold. To-day, however, this fundamental principle of economics is largely lost sight of, and the discount now is determined not by how much is sold but rather by the type of buyer. Thus a contractor gets one discount, a central station perhaps another, and a jobber another and ordinarily the largest.

Therefore it is not uncommon for a contractor to obtain an order for a washing machine, say, and then order one from the jobber or manufacturer to take care of the order. Although a retail transaction, the contractor not only expects but receives his discount. Hundreds of other examples of a similar nature could be cited.

In fact, since prices have become so high contractors and dealers have been buying in smaller lots from the jobber than ever before. Little stocking has been done. The buying has been as required.

Within the last two years a number of the large distributers of electrical goods of a merchandise character have felt the need for a change and consequently have discontinued the trade discount in certain lines and substituted therefor a standard-package or unit discount. Thus a standard package or unit would be composed of say six articles; these packages might come packed in lots of twelve, which would be a larger unit, and perhaps a third unit might be a car-load lot. A buyer to obtain a discount must therefore buy in units no matter who he is. If he purchases five articles, he will pay list; six articles, 10 per cent, or whatever it might be, off. If twelve packages are purchased, there is an additional discount, and if a purchaser buys the articles in car-load lots then there is probably a further discount.

There is a difference, however, as will be noted, between this plan and the plan of a discount in proportion to the amount of the purchase. Thus the plan here described contemplates only standard-package purchases. To explain, if a buyer wanted, say seven articles, then he would be charged for six at the standard package rate and one at the list price. In other words, the discount applies only to the standard packages and a penalty attaches to the breaking of a standard package.

This plan has been tried out on fans, fixtures and heating devices by one manufacturer and is contemplated on a number of other lines. In effect, the plan is quite simple and is founded on economy of production and distribution. The standard packages are easy to handle, easy to keep track of and inventory, and render theft less likely. The work of manufacture is routed through the shop in standard-package lots, and all costs are kept in these units. It is therefore less expensive to sell in these units. Furthermore, the stand is taken by those using this plan that no person is entitled to a discount who cannot buy at least a standard package.

While the use of such a plan is still in its infancy, there is every indication that its application will be very greatly broadened in the near future, particularly in the dealings of the jobber with the trade.

LOWER-PRICED LIGHTING FIXTURES OF STEEL

The Higher Wages Now Earned by the Laboring Classes Have Created a Demand That Manufacturers Are Supplying

A brisk demand for low-priced lighting fixtures has led a number of fixture manufacturers to place on the market a new line of fixtures of the same design and appearance as expensive fixtures but produced to sell at a very low price. The secret of the low price is steel. In place of brass, which is used in the more expensive fixtures, pressed steel with a brass finish is employed.

This increased demand is coming from the laboring people, who during the last year and a half or more have been earning high wages. The demand for more expensive fixtures has fallen off perceptibly, since the buyers of this class of goods are the salaried men. The laborer, however, has now more money than he ever had before, and consequently one of the trades to feel this increased buying power is the fixture trade.

FRENCH IMPORTS OF LUXURIES PROHIBITED

Useful Merchandise, Which Probably Includes Incandescent Lamps, Motors, Etc., Is to Be Limited in Amount

A recent decree by the French government prohibits the importation, except in individual cases where special permission is secured from the Minister of Commerce, of all goods regarded as luxuries. Raw material necessary for production will continue to be imported without restriction. Merchandise considered to be useful but not absolutely indispensable will be admitted to a limited degree, the limit to be designated quarterly.

American manufacturers of electrical specialties and luxuries, such as the general run of household devices, table lamps and decorative glassware, will probably find their goods in the prohibited class. Manufacturers, however, of incandescent lamps and electrical machinery and equipment for power and industrial purposes will probably fall within the class in which the importation is limited in amount. It is doubtful, however, if under existing conditions any very drastic action will be taken by the French government in connection with electrical goods of this nature.

AMERICAN WOOD PRESERVER A SUBSTITUTE FOR GERMAN

The War Has Caused the Development in the United States of a Product That Will Supply Entire Demand

Until 1914 many products were in general use in America which were produced almost exclusively abroad. Since the war, however, the American trade has learned to manufacture for itself and has proved that when actually put to it it can produce practically anything it needs right at home.

An interesting example of this is found in the so-called carbolineum, or anthracene wood-preserving oils. Until the war German products controlled the American trade. American manufacturers of wood preserver found it more profitable to act as local representatives for German agents than to attempt to compete. One of the reasons that the Ger-

man oil was so well established in America was its so-called secret process of manufacture. The oil was said to contain mysterious chemicals made by secret processes known only to the Germans. Such statements as these were made simply to keep the Americans out of the manufacturing business. Since the war, however, an American preservative has been discovered which will supply the entire demand.

IMPORTS OF ELECTRICAL APPARATUS IN JAMAICA

Mostly of American Origin Because in Many Instances Original Installations Consisted of American Equipment

American manufacturers furnish most of the electrical supplies and equipment used in Jamaica, according to a report recently submitted by Consul Ross Hazeltine to the Department of Commerce. There is no local manufacture of these products. The imports are grouped separately under two headings, as follows: (1) Apparatus necessary for generating, storing, conducting, converting into power or light and measuring electricity, and (2) telegraph and telephonic wire and apparatus. The imports of both groups fall under the list of articles admitted duty free.

During 1914 the imports of the first group amounted to $51,252 and in 1915 to $34,021, and the second group to $6,966 and $6,588 respectively. That the United States supplies such a large percentage of the electrical equipment imported into Jamaica may be attributed to the fact that in many instances the original installations consisted of American equipment. In general, the equipment is much the same as that in use in the United States, although somewhat antiquated.

PROMPT PAY FOR ARMY AND NAVY WORK BILLS

Decisive Action Taken by Government in Recognition of Extent of Working Capital That Will Be Involved

The Committee on Public Information has issued the following:

"The War and Navy Departments have both taken decisive action to make sure that contractors who are selling materials to the government are paid more promptly even than is the practice in general business. Both departments have recognized that large amounts of working capital are required in filling these contracts and are assisting in every way to prevent funds from being tied up by making payments without delay. To correct any possible misapprehensions of prospective bidders on this score the general munitions board of the Council of National Defense has authorized the following:

"In a recent memorandum to the general munitions board, as a result of reports that some proposed contractors were hesitant about government contracts because of a fear that they would be hampered by delays in the payment of bills, Quartermaster General Sharpe said:

" 'You are advised that immediately upon the approval of the urgent deficiency act of June 15, 1917, all depot quartermasters were immediately furnished with the funds necessary to enable them to make settlement in full with all contractors who had claims against the government for services rendered or supplies furnished the Quartermaster Corps. These outstanding obligations have now been fully satisfied, and at the present time all contractors are being promptly paid the amounts due them.'

"The Navy Department intends to put the following memorandum on its notice to bidders: 'The navy desires to have contractors paid promptly for all materials furnished under contract. If prompt payment is not received, please take up the matter with the supply officer of the navy yard to which delivery is made. In case of any special delivery it will be appreciated if you will report the facts here.' "

THE WEEK IN TRADE

OF GREATEST interest to the local trade at this time is the construction of the government cantonments. Large quantities of electrical staples and much labor will be employed. Reports from Chicago indicate that very fair prices can be expected from the government, but up to the time of going to press there has been no indication as to whether supplies will be purchased locally or by the government.

Prices were generally stable during the week. Dry batteries were advanced, and late reports indicate higher prices on conduit and porcelain. Steel reflectors advanced, but it is doubtful if this is indicative of an advance all along the line in reflectors.

The volume of trade seems to be maintained generally, with an apparent slowing up in building materials. This condition, however, is felt to be temporary, and better times are looked for later in the summer.

Deliveries are now getting better. Credit conditions seem good.

Fan sales to the consumer are opening up, and the few hot days of the past week have gone a long way toward reducing stocks that are somewhat limited. It is the prevailing sentiment that a few more really hot days in the next two weeks will absolutely clean up all available stocks.

NEW YORK

There has been little change during the week. Building operations appear to be falling off somewhat, although a report in the *Record and Guide* tends to show that building operations in this locality begun during May, 1917, amounted to $12,415,000, as compared with $6,320,000 during May, 1916. While this represents an increase of almost 100 per cent, it will be remembered that prices have advanced to new high levels and that therefore it is very doubtful if the actual volume of new construction has increased very much. Prices were inclined to stiffen somewhat during the week.

There is a prospect of considerable electrical material to be used in the construction of army cantonments, the work on which will be of an inexpensive nature—no iron conduit or expensive fittings.

Low-priced stocks seem to be fast decreasing, and there is therefore less evidence of selling under the market.

Armored Flexible Steel Conductor.—The market is quiet with light demand.

Dry Batteries.—An advance of 15 per cent roughly was placed in effect at the end of June. The increase was caused by the high prices for the elements of manufacture.

Iron Conduits.—The market is steady, but it is difficult to obtain a quotation. Shipments are now made with prices quoted as of date of shipment.

Lamp Cord.—The demand is good, but it is hard to get a sufficient supply owing to the difficulty met by manufacturers in securing fine copper strands.

Outlet Boxes.—There has been no change in this market for boxes. It is daily becoming more evident that it is going to be difficult to obtain a proper supply of outlet boxes or other materials into which sheet steel enters as a prominent part. The need of the government for steel products makes it apparent that before long the supply available for other purposes will be greatly curtailed and limited.

Pipe Fittings.—The market for these items is controlled by the demand for pipe, which continues steady in tone.

Standard Porcelain.—A report from Trenton, N. J., states that the 1200 porcelain workers who have been on strike there for three months voted on Sunday to return to work on the next morning. On April 2 nearly 1200 quit work for better shop conditions and for more pay. A partial increase was offered and some of the men returned, but a majority held out for the original demands. At Sunday's meeting strikers accepted the offer made by

the manufacturers. Owing to general conditions stocks of porcelain are low and many manufacturers of wiring devices are having difficulty in keeping up with orders into which porcelain enters.

Rubber-Covered Wire.—Prices remain about the same. Demand is slowing up following new construction. It is difficult and becoming more so to obtain stranded wire because of the demand and the insufficient supply of stranding machines.

Weatherproof Wire.—The market being largely dependent upon central station activity, there is not so much now being used in this locality.

Fans.—Demand is excellent, stocks in the hands of distributers limited. Manufacturers have not been able to supply the entire demand.

Steel Shades.—There has been a material advance in prices.

Power Cables.—The heavier sizes for underground and submarine work are in large demand. In New York City and Brooklyn the central stations are using large quantities of underground armored cable just at present. The government is buying considerable cable for submarine purposes.

Lamps.—Demand continues strong.

Machinery.—Extraordinary demand and increasing cost of production have caused prices to advance again. Some manufacturers have put a 10 per cent increase into effect, and others are expected to follow shortly.

CHICAGO

Chicago jobbers are experiencing an excellent business. There was a time just after war was declared when it seemed that a panicky feeling might hold up buying, but this proved temporary and, as seen in retrospect, is quite analogous to the situation which existed upon the declaration of war between England and Germany, except that the panicky feeling was not nearly so pronounced this time as before. The contractors, not only in Chicago but in surrounding territory, should be viewed in two classes to analyze properly the situation in their businesses. Those who are depending on apartment-house and other speculative building are out of luck. Those who are doing industrial plant work are exceedingly busy. The foregoing situation is influenced largely by the fact that the high prices of building material are acting to limit building to that class which must build at once. The railroads are buying, but there is some doubt as to what effect upon railroad purchases the unfavorable ruling on freight rates will have. The fact that money is a little higher than it has been seems to have no effect on business in general. Jobbers' deliveries to customers are about normal and manufacturers' deliveries to jobbers are a little better than usual on the whole. Collections and credits remain excellent.

Minneapolis jobbers are fairly well stocked up. Contractors and dealers have not a very large stock and are buying from hand to mouth. No heavy buying is expected in the next sixty days.

Flood Lamps.—While not much information is available concerning government contracts, it has been learned that one concern is making a large number of flood lamps for submarine chasers. These units are made completely of brass and are special throughout. They contain a 200-watt lamp and are to be equipped with control apparatus which will permit flashing the Morse code. General business in floodlighting equipment remains good. Some of the factories are making immediate deliveries even though this entails setting orders of other lighting equipment further back in delivery.

Fans.—In the St. Louis and Kansas City territory the few hot days of the past week caused the public to start buying fans. It also caused the electrical people in that territory to try without success to add to their fan stocks. In Chicago the fan purchasing has not yet begun with vigor. It is the general belief that three or four good hot days throughout the Middle Western territory would absolutely clean out the entire fan stock.

Electrical Supplies for Cantonments.—There is a rumor abroad in the trade that the government has instituted a new policy in connection with the electrical purchases which it is making for cantonment lighting. Rubber-covered wire and socket manufacturers were invited to come to Washing to co-operate with the quartermaster's department. This plan was adopted in order to facilitate deliveries. When the manufacturers had looked over the specifications and the government officials had learned what each manufacturer had in the way of raw material on hand, orders were apportioned in a manner that would permit early delivery of all goods. The wire, it is understood, will be supplied by about thirty factories. It is said that the price on sockets to the government will be a little less than the export price, which is better than the manufacturer's price to domestic jobbers.

Dry Batteries.—Prices have advanced about 12 per cent for small quantities.

BOSTON

Intense activity continues to characterize trade conditions in New England. Although some prospect of lower prices on coal is in sight, owners of private power plants are continuing to seek central station service, and companies with spare generating and distributing facilities are doing a land-office business in cases where an adequate coal supply is on hand. The large hydroelectric power companies are making every effort possible to increase their facilities, and the trade has not ceased to talk about the New England Power Company's proposed early expenditure of $7,000,000 in new plant and line facilities, including important industrial substation enlargements. Jobbers are as a rule rather fully stocked. Deliveries are a little improved, owing to better organization of railroad service. In the electrical contracting field, labor supply is at present reasonably adequate, but it is uncertain how long this condition will obtain.

During the week prices advanced in brass socket material, dry batteries and conduit, as noted below. Fans are moving freely, weather conditions, while not extreme, being favorable to this class of business. It is rumored that further advances in the price of porcelain and of lamps for foreign trade are to be expected, but nothing definite had materialized up to Monday. On the whole, the bulk of electrical supplies remain at about the previous price levels. Increasing confidence in the stability of the electrical trade is apparent, but a note has been sounded by jobbing interests to the effect that improved credit conditions among small electrical contractors would help the general situation materially. Collections are somewhat tight. Very little improvement is to be seen in the motor market.

Electric Flatirons.—Volume of business holding well, no price changes.

Lamps.—Intended advance rumored on lamps for export trade, but not yet announced. No prospect of advance on domestic lamps. Volume of lamp business holding steadily, and factory enlargement is a feature of this class of production. Immediate deliveries can now be made on many standard lamp units.

Reflectors.—Advance on resales reported on certain older lines of equipment by one manufacturer, notably those suitable to the straight tungsten type of lamp. No general advance in reflectors anticipated at this time. Government orders feature this branch of industry, but progressive manufacturers are planning factory work to continue to meet regular industrial demands as far as possible without permitting former work seriously to interfere with non-military trade.

Iron Conduit.—Price advance of 5 per cent reported July 2. Market affected by heavy war demands on steel industry and railroad congestion.

Dry Batteries.—Advance to 40-cent standard announced July 2 by manufacturers.

Porcelain.—Present price level regarded as very high, and while another advance is rumored for the future, some skepticism is expressed regarding willingness of trade to meet further increases.

Insulating Tape (friction).—Price advance of about 15 per cent July 2, and with cotton at 25 cents per pound further increases are looked for as within possibilities.

Electric Ranges.—Slow but steady sale of these equipments in Boston district noted in spite of adverse circumstances, such as 40 to 60 per cent increase in price compared with year ago, and great reduction in number of new apartment houses erected this year. Ranges going mainly into single residences.

Wire and Cable.—Government orders are active, and commercial deliveries are correspondingly retarded. Prices show little if any variation compared with a week ago, though cotton is strong and may force slight changes in future.

Electric Fans.—More seasonable weather and knowledge of limited production facilities as to fans is stimulating the demand for this class of equipment. In jobbing circles some fear that the consumer might think fans in the luxury class has been dissipated by the evident buying power of the general public.

ATLANTA

Business in all lines of the electrical field is very brisk and with no apparent indications of any break in the healthy condition that has existed for some time, notwithstanding advancing prices for materials and labor and increasing lengths of deliveries in nearly all lines. Manufacturers, jobbers and contractors report collections as being very good. One manufacturer states that collections since Jan. 1 are 10 per cent better than the past four years.

Copper.—Prices firm, but stocks are badly depleted.

Wire.—Rubber-covered and weatherproof stocks are very low, with factory shipments improving.

Wiring Devices.—There is a very strong demand for sockets, receptacles, cut-outs, plugs, etc., and local stocks seem to be holding up well, covering immediate requirements.

Cable.—Demand for large cables exceeds supply, with no visible stock. Shipments getting longer, and all requirements should be anticipated.

Lamps.—Dull season of year and stocks are accumulating which will take care of expected normal fall demand.

Heating Appliances.—Business below normal, prices advancing sharply. Stocks in good shape.

Transformers.—Strong demand even in the face of advancing prices. Stocks depleted and deliveries getting longer with no betterment in sight.

Meters.—Very active market, stocks in fairly good shape.

Motors.—The recent price advance does not seem to curtail demands, especially in textile field. Practically no stocks, and no really definite shipment promises are being made.

Conduit.—There is a good demand for conduit, panelboards and outlets in spite of rising prices. Stocks are very low and no improvement in deliveries is expected soon.

Pole and Line Material.—Steady market with increasing prices. Stocks in good shape owing to anticipated orders covering future requirements.

Labor.—The labor situation is easy at present. Wages 10 to 15 per cent higher than a year ago.

SAN FRANCISCO

Pacific Coast jobbers now have an investment in stocks about 30 per cent higher than two years ago, partly on account of higher prices, and partly on account of delayed deliveries. Condition of stocks is generally good, and shipments are fair. Prices are dormant except for conduit, which shows slight increase. Deliveries on wire and conduit less certain than other lines. These two items are the most active just now, probably largely because of very heavy industrial demands and factory extensions, also much naval and oil company business. Large orders are expected for cantonment construction and similar government work, but sufficient notice is expected so that these can be handled as special business not affecting stocks. June credit and collections were below the good showing in previous months of this year. This is charged to Liberty bond and Red Cross campaigns. All San Francisco jobbing houses report fans practically sold out.

SEATTLE

The weeks following the declaration of war showed a marked increase in retail business in the Northwest. The panicky state which prevailed for a short time is now over and dealers have succeeded in establishing industrial business, which is good, and reported increasing. Government contracts from United States Navy Yard at Bremerton, Wash., American Lake (Wash.) cantonment and Alaska have done much to increase the volume of business. This is especially true as regards the American Lake cantonment, where an enormous amount of electrical equipment will be needed. Heavy demands from shipbuilding plants continue.

Sales of household appliances are picking up noticeably, especially during the last month. This fact is surprising, as conservative dealers believed prospective purchasers would hesitate on account of unsettled conditions. Dealers say that the increases along this line show electrical household devices are considered as economies and not luxuries. Small constructions, particularly residential, are at low ebb.

There is little speculative building, owing to the excessive cost of all material. Portland a year ago was issuing from fifty to seventy-five building permits daily. It now averages three daily. Seattle's proportion is about the same. Industrial building in Seattle and Portland is much below normal. Reticent buying characterizes this condition here. Dealers believe that the peak has been reached and are hesitating to order in large amounts. A conservative condition prevails. In small work stock is ordered as needed. Deliveries are better than for some time past. This is attributed to the action of the government and to the cooperation of the railroads. Prices along some lines have slightly increased. Money is plentiful and collections good.

Copper.—Copper is at a standstill and no change has been noted for several weeks.

Conduit.—Conduit is still advancing and output is decreasing. White pipe is much easier to obtain than black. Demand is heavy and stocks are low.

Heating Appliances.—Movement on heating appliances is expected shortly.

METAL MARKETS CONDITIONS

Strikes in Copper Mines Cause Reduction in Production

The metal markets were generally quiet during the past week. Copper, tin and spelter showed a slight falling off, while other metals held firm.

Strikes by miners in a number of copper mines have curtailed production, but it is not expected that the market will feel the effects thereof for some time. As these pages go to press, certain of the strikes have been settled, the men have returned to work, and the operators are expecting the men at the other mines to come to an agreement shortly.

No decision has been made by the government regarding the price it is willing to pay for copper. Various estimates run anywhere from 20 cents to 25 cents.

Nominal quotations were made for electrolytic as follows on Monday last: July, 31.62½ cents; August, 30.50 cents; third quarter, 30.50 cents; fourth quarter, 28.87½ cents.

NEW YORK METAL MARKET PRICES

	June 25	July 2
Copper:	£ s d	£ s d
London, standard spot	130 0 0	130 0 0
Prime Lake	30.50 to 31.50*	30.50 to 31.50*
Electrolytic	32.25 to 32.50*	31.50 to 31.75*
Casting	30.00 to 30.50*	29.25 to 29.75*
Wire base	37.00 to 38 00*	37.00 to 38.00*
Lead, trust price	11.00	11.00
Nickel, ingot	50.00	50.00
Sheet zinc, f.o.b. smelter	19.00	19.00
Spelter, spot	9.30 to 9.42½	9.17½
Tin, Straits	62.87½*	62.00
Aluminum, 98 to 99 per cent	56.00 to 58.00*	55.00 to 57.00*

OLD METALS

Heavy copper and wire	27.75 to 28.00	27.50 to 27.75
Brass, heavy	17.50 to 18.00	17.00 to 17.50
Brass, light	14.50 to 14.75	14.00 to 14.50
Lead, heavy	10.25 to 10.50	10.00 to 10.25
Zinc, old scrap	7.00 to 7.25	6.75 to 7.00

*Nominal.

Current Prices of Electrical Supplies

NEW YORK AND CHICAGO QUOTATIONS

The prices quoted are those prevailing in standard package or specified lots on apparatus and appliances in Eastern and Middle West markets at the beginning of business on Monday of this week. They are in all cases the net prices or prices subject to discounts from standard lists to contractors, central stations, dealers and others engaged in the resale of such goods.

Prices in Southern and other nearby markets will rule about the same as those in the Middle West, although slight modifications to cover increased freight and local demands should be expected. In the Far West and on the Pacific Coast the prevailing prices are naturally higher, covering as they must increased freight and the necessity of larger stocks with increased interest and warehouse charges on account of the distances from sources of supply, infrequent turnover of stock and uncertainty as to delivery of goods in transit. Moreover, the Far West presents a wide variation in demand due to a small population spread over a wide area in agricultural and mining communities, as contrasted with the denser population of the East and Middle West, their nearness to the source of supply, the more frequent turnover in stocks and the constant demands which arise in industrial centers.

The variation in prices may be due to the difference in grade of products made by different manufacturers, to local conditions or to both.

ARMORED CONDUCTORS, FLEXIBLE STEEL

Single-Conductor

B. & S. Size	List, per 1000 Ft.
No. 14 solid	$61.00
No. 12 solid	71.00
No. 10 solid	90.00
No. 8 solid	106.00
No. 6 solid	145.00
No. 10 stranded	95.00
No. 8 stranded	115.00
No. 6 stranded	160.00
No. 4 stranded	205.00
No. 2 stranded	266.00
No. 1 stranded	315.00

Twin-Conductor

No. 14 solid	104.00
No. 12 solid	135.00
No. 10 solid	185.00
No. 8 stranded	235.00
No. 6 stranded	370.00
No. 4 stranded	575.00

NET PRICE AND DISCOUNT PER 1000 FT.—NEW YORK

Single-Conductor

No. 14 solid:	
Less than coil	+10% to $54.90 Net
Coil to 1000 ft.	3% to 48.80 Net
No. 12 solid:	
Less than coil	+10% to 63.90 Net
Coil to 1000 ft.	3% to 56.80 Net

Twin-Conductor

No. 14 solid:	
Less than coil	+10% to $78.00 Net
Coil to 1000 ft.	3% to 75.00 Net
No. 12 solid:	
Less than coil	+10% to 121.00 Net
Coil to 1000 ft.	3% to 108.00 Net

CHICAGO

Single-Conductor

	Discount
No. 14 solid:	
Less than coil	Net to +10%
Coil to 1000 ft.	10% to 15%
No. 12 solid:	
Less than coil	Net to +10%
Coil to 1000 ft.	10% to 15%

Twin-Conductor

No. 14 solid:	
Less than coil	Net to +10%
Coil to 1000 ft.	10% to 15%
No. 12 solid:	
Less than coil	Net to +10%
Coil to 1000 ft.	10% to 15%

ATTACHMENT PLUGS

List ranges from $0.22 to $0.30 each.
Standard packages from 100 to 250.

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	+20% to 12%
1/5 to std. pkg.	10% to 20%
Std. pkg.	24% to 34%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	+12% to +20%
1/5 to std. pkg.	20% to 10%
Std. pkg.	30% to 44%

BATTERIES, DRY

NEW YORK

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.35	$0.35
12 to 50	.30	.30
50 to barrel	.28	.28 to .29
Barrel lots	.24	.25

CHICAGO

Each Net	No. 6 Regular	No. 6 Ignitor
Less than 12	$0.39	$0.39
12 to 30	.34	.34
50 to barrel	.26¼ to .295	.269 to 27¼
Barrel lots	.24¾ to .29	.25¾ to 29

CONDUIT, METALLIC FLEXIBLE

Size, In.	Ft. per Coil	List per 100 Ft.
5/16	250	$5.00
⅜	250	7.50
½	100	10.00
¾	50	13.00
1	50	21.00
1¼	50	26.00
1½	25-50	35.00
2	25-50	45.00
2½	25-50	52.00

DISCOUNT—NEW YORK

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip		
⅜-in. double strip		
½-in. single strip	Net to 10%	7% to 20%
½-in. double strip	Net to 5%	4% to 15%

NET PER 1000 FT.—CHICAGO

	Less than Coil	Coil to 1000 Ft.
⅜-in. single strip	$71.25 to $75.00	$60.00 to $63.75
⅜-in. double strip	75.00 to 78.75	67.50 to 71.25
½-in. single strip	95.00 to 100.00	80.00 to 85.00
½-in. double strip	100.00 to 105.00	90.00 to 95.00

CONDUIT, NON-METALLIC FLEXIBLE

Size, in.	List, per Foot	Size, in.	List, per Foot
7/32	$0.05½	1	$0.25
¼	.06	1¼	.33
⅜	.09	1½	.40
½	.12	1¾	.47
⅝	.15	2	.55
¾	.18	2¼	.65

DISCOUNT—NEW YORK

Less Than $15 List	$15 to 60 List	$60 to $150 List
Net to 33⅓%	45% to 50%	53% to 55%

NET PER 1000 FT.—CHICAGO

	Less Than $15 List	$15 to $60 List	$60 to $150 List
7/32-in	$36.67	$27.50	$24.75
¼-in.	40.00	30.00	27.00

CONDUIT, COUPLINGS AND ELBOWS, RIGID IRON

Card No. 38

Size, in.	Conduit, List per Foot
¼	$0.08½
⅜	.08½
½	.08½
¾	.11½
1	.17
1¼	.23
1½	.27½
2	.37
2½	.58½
3	.76½

	Couplings, List	Elbows, List
¼	$0.05	$0.19
⅜	.06	.19
½	.07	.19
¾	.10	.25
1	.13	.37
1¼	.17	.45
1½	.21	.60
2	.28	1.10
2½	.40	1.80
3	.60	4.80

DISCOUNT—NEW YORK

	¼ In. to ½ In.	¾ In. to 3 In.
Less than 2500 lb.	6% to 8%	8% to 10%
2500 to 5000 lb...	9% to 11%	11% to 13%

(For galvanized deduct six points from above discounts.)

DISCOUNT—CHICAGO

	¼ In. to ½ In.	¾ In. to 3 In.
Less than 2500 lb.	3.8%	5.8%
2500 to 5000 lb.	6.8%	8.8%

(For galvanized deduct six points from above discounts.)

FLATIRONS

NEW YORK

Net ..... $3.15 to $3.50

CHICAGO

Net ..... $3.75 to $3.85

FUSES, INCLOSED

250-Volt	Std. Pkg.	List
3-amp. to 30-amp.	100	$0.25
35-amp. to 60-amp.	100	.35
65-amp. to 100-amp.	50	.90
110-amp. to 200-amp.	25	2.00
225-amp. to 400-amp.	25	3.60
450-amp. to 600-amp.	10	5.50
600-Volt		
3-amp. to 30-amp.	100	$0.40
35-amp. to 60-amp.	100	.60
65-amp. to 100-amp.	50	1.50
110-amp. to 200-amp.	25	2.50
225-amp. to 400-amp.	25	5.50
450-amp. to 600-amp.	10	8.00

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	28%
1/5 to std. pkg.	38%

FUSE PLUGS

3-Amp. to 30-Amp.

NEW YORK

	Per 100 Net
Less than 1/5 std. pkg.	$5.75 to $6.30
1/5 to std. pkg.	4.50 to 5.25

Standard package, 500. List, $0.07.

CHICAGO

	Per 100 Net
Less than 1/5 std. pkg.	$6.25
1/5 to std. pkg.	5.25

Standard package, 500. List, $0.07.

LAMPS, MAZDA

105 to 125 Volts

Regular, clear:	Std. Pkg.	List, Each
10 to 40-watt—B	100	$0.27
60-watt—B	100	.36
100-watt—B	24	.65
75-watt—C	50	.65
100-watt—C	24	1.00
200-watt—C	24	2.00
300-watt—C	24	3.00
Round bulbs, 3½ in., frosted:		
15-watt—G 25	50	.50
25-watt—G 25	50	.50
40-watt—G 25	50	.50
Round bulbs, 3¾ in., frosted:		
60-watt—G 30	24	.72
Round bulbs, 4¾ in., frosted:		
100-watt—G 35	24	1.05

DISCOUNT—NEW YORK

Less than std. pkg.	Net
Std. pkg.	10%

DISCOUNT—CHICAGO

Less than std. pkg.	Net
Std. pkg.	10%

LAMP CORD

Cotton-Covered, Type C, No. 18

NEW YORK

	Per 1000 Ft. Net
Less than coil (250 ft.)	$30.00 to $35.17
Coil to 1000 ft.	21.00 to 26.73

CHICAGO

	Per 1000 Ft. Net
Less than coil (250 ft.)	$37.20 to $37.84
Coil to 1000 ft.	27.90 to 28.38

LAMP GUARDS, WIRE

Standard packages from 50 to 150.

NEW YORK

Net per 100	$18.00 to $29.00

CHICAGO

Net per 100	$12.50 to $25.00

OUTLET BOXES

Nos.	List, per 100
101—A, A1½, 4 S.C., 6200, 320	$30.00
102—B.A., 6200 S.E., 300, A.X. 1½, 4 S.	30.00
103—C.A., 9, 4 R., B 1½	25.00
106—F.A., 7, C.S. 1½, 3 R.	20.00

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $10.00 list	List to 33%	List to 27%
$10.00 to $50.00 list	42%	18% to 37%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $10.00 list	40% to 43%	35% to 37%
$10.00 to $50.00 list	53%	40% to 48%

PIPE FITTINGS

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	20%
Std. pkg.	30%

PORCELAIN CLEATS—UNGLAZED

2 and 3 Wire

NEW YORK

	Per 1000 Net
Less than 1/5 std. pkg.	$14.00 to $20.00
1/5 to std. pkg.	13.00 to 15.80

Standard package, 2200. List per 1000, $20.

CHICAGO

	Per 1000 Net
Less than 1/5 std. pkg.	$14.00 to $18.00
1/5 to std. pkg.	13.00

Standard package, 2200. List per 1000, $20.

PORCELAIN KNOBS

NEW YORK

Per 1000 Net	5½ N.C.—Solid Std. Pkg. 3500	Nail-It—N.C. Std. Pkg. 4000
Less than 1/5 std. pkg.	$10.50 to $24.30	$21.10
1/5 to std. pkg.	9.75 to 12.15	28.00

CHICAGO

Per 1000 Net	5½ N.C.—Solid Std. Pkg. 3500	Nail-it—N.C. Std. Pkg. 4000
Less than 1/5 std. pkg.	$10.50 to $18.00	$20.75 to $28.00
1/5 to std. pkg.	9.00 to 9.75	16.30 to 21.50

SOCKETS AND RECEPTACLES

	Std. Pk.	List
⅛-in. cap key and push sockets	500	$0.33
⅛-in. cap keyless socket	500	.30
⅛-in. cap pull socket	250	.60

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	Net
1/5 to std. pkg.	15%

DISCOUNT—CHICAGO

Less than 1/5 std. pg.	Net list
1/5 to std. pkg.	15%

SWITCHES, KNIFE

250-Volt, Front Connections, No Fuse

High Grade:	List
30-amp. S. P. S. T.	$0.80
60-amp. S. P. S. T.	1.20
100-amp. S. P. S. T.	2.25
200-amp. S. P. S. T.	3.48
300-amp. S. P. S. T.	5.34
30-amp. D. P. S. T.	1.20
60-amp. D. P. S. T.	1.78
100-amp. D. P. S. T.	3.38
200-amp. D. P. S. T.	5.20
300-amp. D. P. S. T.	8.00
30-amp. 3 P. S. T.	1.80
60-amp. 3 P. S. T.	2.68
100-amp. 3 P. S. T.	5.08
200-amp. 3 P. S. T.	7.80
300-amp. 3 P. S. T.	12.00
Low Grade:	
30-amp. S. P. S. T.	0.42
60-amp. S. P. S. T.	0.74
100-amp. S. P. S. T.	1.50
200-amp. S. P. S. T.	2.70
30-amp. D. P. S. T.	0.68
60-amp. D. P. S. T.	1.22
100-amp. D. P. S. T.	2.50
200-amp. D. P. S. T.	4.50
30-amp. 3 P. S. T.	1.02
60-amp. 3 P. S. T.	1.84
100-amp. 3 P. S. T.	3.76
200-amp. 3 P. S. T.	6.76

DISCOUNT—NEW YORK

Less than $10 list	
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

DISCOUNT—CHICAGO

Less than $10 list	+5% to 5%
$10 to $25 list	11% to 16%
$25 to $50 list	14% to 24%

SWITCHES, SNAP AND FLUSH

5-Amp. and 10-Amp., 125-Volt Snap Switches

	Std. Pkg.	List
5-amp. single pole	250	$0.28
5-amp. single-pole, ind.	250	.32
10-amp. single-pole	100	.48
10-amp. single-pole, ind.	100	.54
5-amp., three-point	100	.56
10-amp., three-point	50	.76
10-amp., 250-volt, D. P.	100	.66

SWITCHES, SNAP AND FLUSH—Cont'd

10-Amp., 250-Volt Push-Button Switches

	Std. Pkg.	List
10-amp. single-pole	100	$0.45
10-amp. three-way	50	.70
10-amp. double-pole	50	.70

DISCOUNT—NEW YORK

Less than 1/5 std. pkg.	10%
1/5 to std. pkg.	15%
Std. pkg.	28%

DISCOUNT—CHICAGO

Less than 1/5 std. pkg.	Net list to +20%
1/5 to std. pkg.	Net list to 15%
Std. pkg.	30%

SWITCH BOXES, SECTIONAL CONDUIT

Union and Similar	List, Each
No. 155	$0.34
No. 160	.60

DISCOUNT—NEW YORK

	Black	Galvanized
Less than $2.00 list	Net to 23%	Net to 18%
$2.00 to $10.00 list	23% to 50%	18% to 40%
$10.00 to $50.00 list	23% to 60%	18% to 52%

DISCOUNT—CHICAGO

	Black	Galvanized
Less than $2.00 list	25% to 50%	20% to 40%
$2.00 to $10.00 list	25% to 50%	20% to 40%
$10.00 to $50.00 list	25% to 64%	20% to 52%

TOASTERS, UPRIGHT

NEW YORK

Net price	$2.10 to $3.50

CHICAGO

Net price	$2.80 to $3.50

WIRE, ANNUNCIATOR

NEW YORK

	Per Lb. Net
No. 18, less than full spools	$0.65
No. 18, full spools	0.55

CHICAGO

	Per Lb. Net
No. 18, less than full spools	$0.565 to $0.6885
No. 18, full spools	0.495 to 0.55

WIRE, RUBBER-COVERED, N. C.

Solid-Conductor, Single-Braid

NEW YORK

	Price per 1000 Ft. Net—		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$15.00-18.00	$12.00-14.50	$11.50-12.50
12	21.06-27.05	18.96-22.85	18.01-20.95
10	29.60-39.27	26.64-33.66	24.68-25.31
8	42.40-51.44	38.16-48.42	33.51-36.25
6	72.19-89.57	64.98-76.80	56.63-61.73

CHICAGO

	Price per 1000 Ft. Net—		
No.	Less than 500 Ft.	500 to 1000 Ft.	1000 to 5000 Ft.
14	$18.00	$16.00	$14.00
12	25.99-29.89	21.96-25.62	20.13-21.35
10	36.48-41.51	30.84-35.58	28.27-29 65
8	43.80-60.13	40.15-51.54	35.77-42.95
6	69.24-82.20	63.47-75.35	56.55-68.50

WIRE, WEATHER-PROOF

Solid-Conductor, Triple-Braid, Sizes 4/0 to 8 Inc.

NEW YORK

	Per 100 Lb. Net
Less than 25 lb.	$40.25 to $45.00
25 to 50 lb.	39.25 to 42.00
50 to 100 lb.	38.00 to 38.25

CHICAGO

	Per 100 Lb. Net
Less than 25 lb.	$42.85 to $45.00
25 to 50 lb.	41.85 to 44.00
50 to 100 lb.	40.85 to 43.00

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Electric Table Stove

The Hughes Electric Heating Company, Chicago, has brought out a new heavy-duty table stove. The heating element is rated at 660 watts and is the standard used in all Hughes hot plates and electric ranges. On account

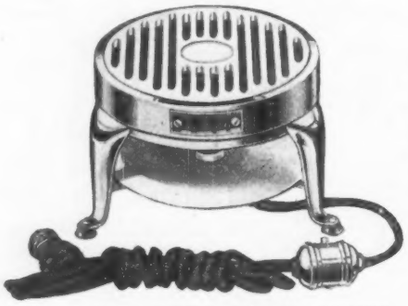


TABLE STOVE WITH ONE-HEAT SWITCH

of the fact that heavy resistance wire recessed in composition plate is used, this table stove operates somewhat on the principle of stored heat, it being possible to utilize the burner for some light cooking even after the energy has been turned off. The table stove is 5 in. (12.7 cm.) in height, and its burner is 6.5 in. (16.5 cm.) in diameter. It is finished in nickel throughout and is furnished with an attachment plug, 7 ft. (2.1 m.) of flexible cord and a single-heat or three-heat switch conveniently located for use at the table. Its shipping weight is 5 lb. (2.3 kg.).

Separable Plug Adapter for Screw-Base Receptacles

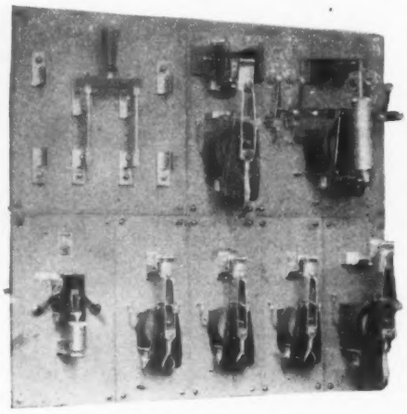
In order to make possible the use of devices fitted with separable attachment plugs in baseboard receptacles of the screw type, a screw-base adapter

DEVICE FOR CONVERTING SCREW-PLUG RECEPTACLE INTO ATTACHMENT PLUG

has been designed by the Bryant Electric Company, Bridgeport, Conn. The device is made to be fastened into the standard Edison receptacle by means of a threaded portion and will serve to permanently convert the old-type receptacle for use with the tongue-type plug. With this addition it will then be possible to use a variety of attachment caps of either reversible or non-reversible polarity type.

Automatic Motor Starter

While manual control can be used for motors in a number of factories, it may be desirable to use an automatic starter because of the safety afforded to the motor, the machine and the operator, and because of the readiness with which motors may be started by simply pushing a button. Apparatus intended for this service is shown in the accompanying illustration. In the upper left-hand corner is a service knife switch with fuse clips. Just to the right of the knife switch panel is the main line



INDUSTRIAL-PLANT MOTOR STARTER OPERATED BY PUSH-BUTTON

magnetic switch, which is operated by a push-button at some remote point. This switch makes and breaks the main motor circuit. The magnetic switches on the lower panel are controlled by an accelerating mechanism, which is the principal feature of this starter.

Instead of starting the motor in a definite length of time, as is done by time-element starters, or in a period directly dependent on the load of the motor, as in current-control types, a combination of these two general methods has been employed. If the motor being started is overloaded, the resistance will be cut out automatically if the motor fails to accelerate properly, thus protecting the resistance against burning out. This operation is performed by an overload relay which opens the main line switch and stops the motor. The apparatus is made by the Rowan Controller Company, Baltimore, Md.

Table Stove

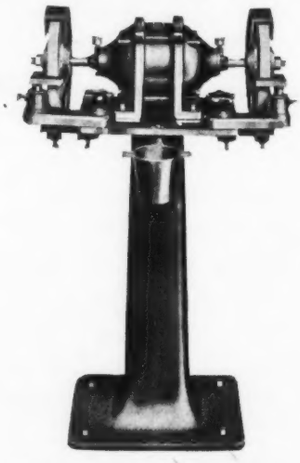
The portable table stove shown herewith has been brought out by the Allmur Manufacturing Company of Marion, Ind. The stove is 8 in. (20.32 cm.) in diameter and 5 in. (12.7 cm.) high. The heating unit is removable

PORTABLE TABLE STOVE

without the use of tools, the element being held in place or contact with wing nuts. This construction, as is pointed out, makes it convenient for the user to remove the element when cleaning other portions of the stove.

Grinding Motor

In the accompanying illustration is shown a self-contained motor-driven tool for machine shops that has been brought out by the U. S. Electrical Manufacturing Company of Los Angeles, Cal. The ball bearings are mounted in a special housing with sealing rings that keep out dirt and grit. The motor is totally inclosed. Convenient tool-grinding rests are adjustable in any direction. The flanges are ample and are turned to insure perfect bal-



SELF-CONTAINED MOTOR-DRIVEN GRINDER

ance, it is claimed. These outfits are sold motor only for bench mounting, motor with pedestal or motor with pedestal guards, tool rests, water bucket, etc.

Washing Machine with a Vacuum Cup

The new electric washing machine recently brought out by the Wayne Manufacturing Company, 100 Sidney Street, St. Louis, Mo., operates on the vacuum-cup principle. The process of

WASHING AND WRINGING MACHINE CONTROLLED BY ONE LEVER

alternately sucking and forcing soapy water and air through the fabric is claimed to do a very thorough job of cleaning. The galvanized vacuum cup consists of a one-piece steel stamping with corrugated sides to give a rubbing action on the clothes. The driving mechanism which is mounted on the lid of the tub causes the vacuum cup to oscillate as it moves up and down, changing the position of the clothes with each stroke. The lifting of the lid of the machine automatically shuts off its operation. The wringer is so arranged that wringing and washing operations may be carried on at the same time or separately. The wringer is reversible and provided with a quick-releasing device. A Robbins & Myers motor is used for driving the outfit.

Sign Flasher with Variety of Uses

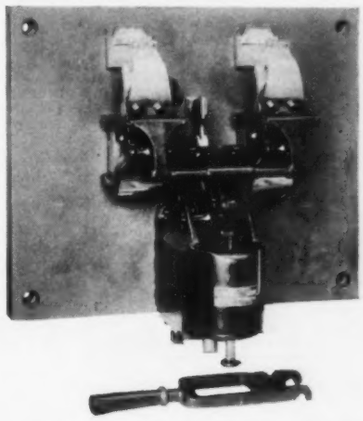
Electric flashers which, besides being used for electric signs, are employed as automatic controllers for controlling solenoids and as contact makers for alarm apparatus, including gongs and sirens, are being manufactured by the Reynolds Electric Company of 422 South Talman Avenue, Chicago, Ill. The flashers are equipped with a number of patented features such as adjustable contacts, detachable brushes and reinforced contact points, besides a number of interchangeable devices which make it convenient to vary the

COMBINATION FLASHER WITH HIGH AND LOW-SPEED DRUMS

effects produced by the outfit. The large flashers consist of two sections, one of which is used for a variety of effects, such as waving flags, revolving wheels or globes, flames, waterfalls, etc. This section revolves at a speed of 60 r.p.m. The smaller section of the combination is driven through reduction gears and revolves at a speed of 6 r.p.m. Switches on this section are used to control reading matter and also to act as master or control switches for the high-speed section.

Field Switches for Remote Control

Double-pole solenoid-operated field switches which may be mounted on or near the field rheostats or located on the exciter board remote from the main control board have been developed by the General Electric Company, Schenectady, N. Y. All of the switches in this line are operated by means of small control units of the push-and-pull button type, which may be located on benchboards or vertical panels. The field switches are similar in construction to non-automatic solenoid-operated air circuit breakers, the principal points of difference being the omission of carbon secondary contacts and the addition of a field discharge switch. The field discharge switch is so arranged that the opening of the solenoid-operated field switch introduces a resistance across the field of sufficient value to prevent any injury to the field coil windings by the inductive "kick" produced by suddenly opening the switch. One set of operating coils is provided, which opens and closes the switch, the magnet frame being centrally spaced between the two poles.



DOUBLE-POLE, SINGLE-THROW, SOLENOID-OPERATED FIELD SWITCH

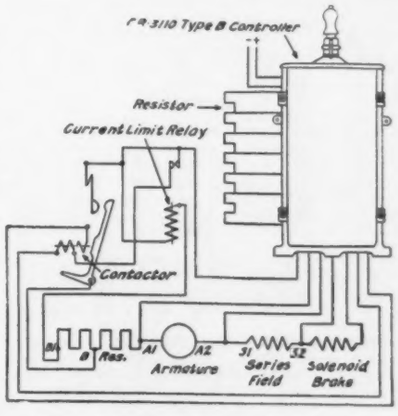
For use with synchronous motors the field switches are designed so that both poles are closed simultaneously, but one pole precedes the other in opening, connecting the discharge resistance across the field. The interval between the opening of the first and second poles of the field switch is obtained by means of a time-limit relay connected in the control circuit. The discharge resistance circuit is opened when this second pole is actuated. Removable handles are provided so that any of these switches may be closed by hand. Insulated buttons, attached to the tripping coil plunger, are provided for hand tripping.

Braking Control for Crane Hoist Service

The General Electric Company of Schenectady, N. Y., has recently brought out an automatic device which can be attached to its standard type B drum controller, and thus make a serviceable semi-magnetic dynamic braking control for crane hoist service. The equipment consists of a panel for wall mounting which contains a direct-current contactor and current-limiting relay, and an extra resistance which is inserted in the circuit during the acceleration and deceleration period.

A dynamic braking, manually operated, drum-type controller is more severe on the commutator of a direct-current series motor than is a plain reversing manual controller, because when lowering the speed the motor is connected in the same way as a shunt-wound motor, and does not have the inherent protection of the series field. In many installations where the service is severe a semi-magnetic equipment will materially assist commutation. This equipment is useful also where the service is not quite severe enough to justify the expense of a full magnetic equipment.

The connections, when used with the dynamic braking controller, are shown in the accompanying illustration. The extra resistance *B-Bl* is to be added to the block *A-B* regularly furnished with this controller. With the new arrangement this block of resistance would be so high that it would be impossible to damage the motor, it is claimed, no matter how quickly the controller is thrown on and off. The contactor and relay simply insert and cut out this resistance when accelerating and decelerating in such a manner as to give practically the same speed characteristics on the motor as would be obtained with a standard controller and at the same time prevent abusive currents. This device, it is pointed out, protects the commutator, controller fingers and segments from severe arcing. It also



CONNECTIONS FOR DYNAMIC BRAKE CONTROLLER

enables the motor to run at a higher lowering speed for a given severity and condition of service, provided extra registers are used to weaken the motor field.

SIDE GUIDE & GRIPPER

Trade Notes

THE BLAW STEEL CONSTRUCTION COMPANY, Barbers Bank Building, Pittsburgh, Pa., has changed its name to the Blaw-Knox Company.

THE LINCOLN ELECTRIC COMPANY of Cleveland, Ohio, announces the opening of an office at 10 High Street, Boston, Mass., under the direction of W. A. Blachford.

THE STANDARD VARNISH WORKS, Chicago, Ill., announce that they have established their advertising department at the head office, 90 West Street, New York City.

THE PITTSBURG ELECTRIC MANUFACTURING COMPANY will build a new one-story building, about 200 ft. by 220 ft., at Penn and Lexington Avenues, Pittsburgh, to cost $50,000.

THE GENERAL ELECTRIC COMPANY will build two additions to its lamp works at Harrison, N. J., comprising a two-story brick and concrete structure, 130 ft. by 250 ft., and a one-story building on Cross Street, about 50 ft. by 90 ft.

D. B. MUGAN, formerly associated with the Illinois Central Railroad Company, in charge of its electrical department at New Orleans, La., has been appointed resident manager of the Edison Storage Battery Supply Company, with headquarters at 201 Baronne Street, New Orleans.

THE BOOTH HALL COMPANY, 565 West Washington Boulevard, Chicago, announces that its services are available as electric furnace builder and engineer. The officers of the company are: Carl H. Booth, president and general manager (formerly president Snyder Electric Furnace Company); William K. Booth, metallurgical engineer (formerly metallurgist Snyder Electric Furnace Company); Julius R. Hall, vice-president and mechanical engineer (formerly production manager Snyder Electric Furnace Company); Douglas Walker, sales manager (formerly sales manager Snyder Electric Furnace Company); Frank J. Sheldon, secretary and treasurer (formerly auditor Snyder Electric Furnace Company).

New Incorporations

THE THOMASVILLE (Ala.) LIGHT & POWER COMPANY has filed articles of incorporation with a capital stock of $3,000.

THE BROOK ELECTRIC COMPANY of Trenton, N. C., has been chartered with a capital stock of $25,000 by Frenifold, M. Brock and others.

THE POCOPSON TOWNSHIP ELECTRIC COMPANY of Philadelphia, Pa., has been chartered with a capital stock of $5,000. J. C. Murtagh is treasurer.

THE DILWORTH TOWNSHIP ELECTRIC COMPANY of Philadelphia, Pa., has been incorporated with a capital stock of $5,000. J. C. Murtagh is treasurer.

THE WUCHLAN LIGHT, HEAT & POWER COMPANY of Coatesville, Pa., has been chartered with a capital stock of $5,000. John E. Zimmerman is treasurer.

THE NEW ELECTRIC LIGHT, HEAT & POWER COMPANY of Coatesville, Pa., has been chartered with a capital stock of $5,000. John E. Zimmerman is treasurer.

THE POCOPSON LIGHT, HEAT & POWER COMPANY of Coatesville, Pa., has been incorporated with a capital stock of $5,000. John E. Zimmerman is treasurer.

THE WEST BRADFORD TOWNSHIP ELECTRIC COMPANY of Philadelphia, Pa., has been granted a charter with a capital stock of $5,000. J. C. Murtagh is treasurer.

THE EAST CALIFORNIA LIGHT, HEAT & POWER COMPANY of Coatesville, Pa., has been granted a charter with a capital stock of $5,000. John E. Zimmerman is treasurer.

THE GOSHEN ELECTRIC LIGHT, HEAT & POWER COMPANY of Coatesville, Pa., has been granted a charter with a capital stock of $5,000. John E. Zimmerman is treasurer.

THE WITHERBEE STORAGE BATTERY COMPANY of New York, N. Y., has been incorporated by Charles Meder, Philip Meder and Charles Staudt. The company is capitalized at $10,000 and proposes to manufacture engines, motors, appliances, etc.

THE A. B. C. ARC LAMP COMPANY of New York, N. Y., has been chartered with a capital stock of $20,000 by William Bach, William A. Cunningham and M. Beach. The company proposes to manufacture arc lamps.

THE ARKANSAS PREPAY FAN COMPANY of Little Rock, Ark., has been incorporated by E. T. Reeves, Hugh D. Hart, G. Berther and others. The company is capitalized at $30,000 and proposes to manufacture electric fans.

THE UNITED MANUFACTURING COMPANY of St. Louis, Mo., has been incorporated with a capital stock of $15,000 to manufacture electrical equipment. The incorporators are: W. F. Byrnes, W. L. Cummiskey and C. R. Baldwin.

THE COSTELLO-HORNER COMPANY of Lakewood, N. J., has been incorporated by Charles W. Costello, Albert Horner and Isaphene B. Peters all of Lakewood. The company is capitalized at $20,000 and proposes to deal in electrical apparatus, etc.

THE ELECTRIC APPLIANCES, LTD., of Hamilton, Ont., Can., has been incorporated by John F. Radigan, George G. Sutherland, Thomas D. Fallon and others. The company is capitalized at $50,000 and proposes to manufacture electric stoves, heaters, furnaces, etc.

THE EASTERN MOUNTAIN LIGHT & POWER COMPANY of Chicago, Ill., has filed articles of incorporation with a capital stock of $425,000. The incorporators are: Miles J. Hall, Harry H. Phillips, Charles J. Horn, Burrell J. Cramer, Frank Conrad and Clarence A. Flinn.

THE PERFECTION STORAGE BATTERY COMPANY of Brooklyn, N. Y., has been chartered with a capital stock of $3,500 to manufacture batteries for autos, bicycles and vehicles. The incorporators are: Robert M. Stevenson, Clarence E. Mundy and Frank E. Stouvenel.

THE NEW HOME GAS & ELECTRIC SUPPLY COMPANY of New York, N. Y., has been incorporated with a capital stock of $50,000 by E. London, H. Kupferberg, and L. Ruderfer, 598 Van Siclen Avenue, Brooklyn, N. Y. The company proposes to deal in gas and electric fixtures, etc.

WARREN G. GREEN of Watertown, N. Y., has filed articles of incorporation with a capital stock of $20,000 for the purpose of dealing in auto and motor boat accessories and electrical supplies. The incorporators are: W. J. Green, L. M. Moore and G. W. Bailey of Watertown, N. Y.

THE WISE-McCLUNG MANUFACTURING COMPANY of New Philadelphia, Ohio, has been chartered with a capital stock of $200,000 to manufacture electric vacuum sweepers. W. A. Wise is president and general manager; W. A. McClung, vice-president and Ivor Harris, secretary and treasurer.

THE NOVELTY ELECTRIC COMPANY of Litchfield, Conn., has been incorporated with a capital stock of $2,000 by Raymond G. Stewart of Watertown, George R. Trumbull of Bantum, and Fred L. Garrigues of Waterbury. The company proposes to manufacture metal goods and electrical novelties.

THE HARTFORD ELECTRIC STEEL CORPORATION of Rocky Hill, Conn., has been chartered with a capital stock of $150,000 by William R. Palmer of Bridgeport, Conn.; Harry S. Blumenthal and Michael Suisman of Hartford. The Dividend plant at Rocky Hill was recently purchased by Messrs. Suisman and Blumenthal.

THE WORLD HARVESTER CORPORATION has filed articles of incorporation under the laws of the State of Delaware with a capial stock of $15,000,000 for the purpose of manufacturing apparatus and mechanical devices operated by electricity or other motive power. The incorporators are: D. Halley Barber, Herbert E. Monahan and Ruth Frackman, all of New York, N. Y.

THE KEYSTONE IRON & STEEL WORKS of Los Angeles, Cal., has been incorporated by J. E. Geyer, A. A. Barton, W. F. Allen, W. S. McGiffert and J. P. Loftus, all of Los Angeles. The company, it is understood, is affiliated with the Keystone Iron Works, 973 North Main Street, which manufacture iron lamp standards, fire hydrants, pumps, etc., and will take over and operate the plant.

THE RUMSEY ELECTRIC COMPANY of Philadelphia, Pa., has been incorporated by Eugene A. Rumsey, Fox Chase, Philadelphia, Pa.; George A. Rumsey, Jr., Stenton, Mount Airy, Philadelphia, Pa.; George A. Rumsey, Sr., Salem, N. J.; Charles H. Kelley, Haddonfield, N. J.; B. F. Hare, Germantown, Philadelphia, and George S. Trimble, 5903 Christian Street, Philadelphia. The company is capitalized at $325,000 and proposes to manufacture electrical appliances, machinery, etc.

Trade Publications

METERS.—Bulletin No. 45 of the Sangamo Electric Company, Springfield, Ill., describes and gives uses of ampere-hour meters.

LUMBER MILLS.—The Wagner Electric Manufacturing Company, St. Louis, Mo., is distributing a booklet on the uses of Wagner motors in lumber mills.

GASOLINE-ELECTRIC AUTOMOBILES.—The Wood Motor Vehicle Company, Chicago, has briefly described its model 54 car with special reference to simplicity of control.

AUTOMOBILE HEADLIGHTING.—The Corning Glass Works of Corning, N. Y., have issued a booklet on the principles of and the results obtained with the Corning "Conaphore" headlight glass.

INSULATORS.—The R. Thomas & Sons Company of East Liverpool, Ohio, has issued catalog No. 16. This describes various types of insulators for all voltages, with tables and illustrations.

DIES AND HOLDERS.—The Greenfield Tap & Die Corporation of Greenfield, Mass., has prepared a booklet describing the "Acorn" die. Tables of sizes and prices of dies and holders are given.

TABLEWARE.—Features of percolators, grills, toasters, etc., manufactured by the Hotpoint Electric Heating Company, Ontario, Cal., are pointed out in a booklet recently issued by that company.

GRAIN STORAGE FIRE ALARM.—The Western Fire Appliance Works, Chicago, are sending out folders of their Zeleny thermometer system for indicating changes in temperature in grain in storage.

MOTORS.—"Motor Installations" is the subject of a book issued by the Wagner Electric Manufacturing Company, St. Louis, illustrating the use of Wagner motors in various lines of industries.

ELECTRIC SIGN EQUIPMENT.—The Reynolds Electric Company, Chicago, describes and gives tables of sizes and prices of its color hoods and flashers. Illustrations of electrical displays are given.

REFLECTORS.—The Holophane Glass Company of New York has published a booklet showing the use of Holophane units wtih type C lamps. Charts and data for designing installations are given.

OXY-ACETYLENE WELDING AND CUTTING.—Apparatus for oxy-acetylene welding and cutting is referred to in a bulletin recently distributed by the Prest-O-Lite Company, Inc., Indianapolis, Ind.

STEEL HARDENING.—The advantages of some of its steel products hardened by the Stroh process are outlined in a bulletin recently prepared by the Stroh Steel Hardening Process Company, Pittsburgh, Pa.

LIGHTING.—The National X-Ray Reflector Company of Chicago and New York has issued catalog 20 on the use of X-ray reflectors for show windows, showcases, floodlighting, industrial and other direct lighting.

MOTORS.—Bulletin 2014 of the Reliance Electric & Engineering Company of Cleveland, Ohio, describes and illustrates the various mechanical and electrical details of type T heavy-duty "Reliance" motors for direct current.

LIGHTING FIXTURES.—The National X-Ray Reflector Company, 21 West Forty-sixth Street, New York City, has sent out a number of leaflets illustrating lighting fixtures for offices, hospitals, showcases and floodlighting purposes.

CHAIN DRIVE.—"The Ideal Drive for Textile Machinery" has recently been issued by the Link Belt Company of Chicago. This book describes and illustrates the Link Belt silent chain drive, which is being used in the textile industry.

HIGH-TENSION BUSBARS.—The Delta-Star Electric Company, Chicago, is distributing bulletin No. 31, describing its "unit type" high-tension busbar wiring supports. Detailed dimension tables are given, and there are 198 illustrations.

AUTOMATIC WEIGHING.—The Richardson Scale Company, Passaic, N. J., has issued bulletin No. 101, which shows the construction, operation and advantages of the Richardson automatic coal scale and the Richardson automatic liquid scale.

CIRCULATING-TYPE WATER HEATER.—The Automatic Electric Faucet Company, San Francisco, Cal., has distributed a folder illustrating the construction of a recently developed circulating-water heater which may be attached to any kitchen boiler.

New England States

TAUNTON, MASS.—The Gas and Electric Light Commissioners have handed down a decision approving the petition of the Fall River Electric Light Company asking for permission to erect wires across the Taunton River for the purpose of transmitting electricity. The company proposes to connect with the transmission system of the Rhode Island Power Company.

TURNERS FALLS, MASS.—The Turners Falls Power & Electric Company has petitioned the Gas and Electric Light Commission for authority to issue $1,030,000 in capital stock. The company has recently entered into a contract with the Springfield Street Railway Company to furnish energy for a long term of years.

NEWPORT, R. I.—A substantial increase in the appropriation for the expansion of the naval torpedo station in Newport has been granted by the Navy Department. The $400,000 originally set aside for the new power plant, it is stated, has been increased to $1,100,000.

SEYMOUR, CONN.—A new electric transmission line, capable of transmitting 2500 kw., is being erected by the Seymour Electric Company from Seymour to Derby. A large substation is being erected at Derby and extensive alterations will be made at the Seymour substation, near George Street.

Middle Atlantic States

ATTICA, N. Y.—The Village Council has authorized Willis E. Hopkins, village clerk, to apply to the Public Service Commission for authority to acquire and conduct the electric plant and water-works system of the Attica Water, Gas & Electric Company, which the village has voted to take over.

BEACON, N. Y.—The power house of the Southern Dutchess Gas & Electric Company was destroyed by fire on June 26, causing a loss of about $100,000. The plant, it is understood, will be rebuilt.

COHOES, N. Y.—Bids will be received by the Board of Contract and Supply, Cohoes, until July 13, for two motor-generators and other electrical equipment for pumping station.

NEWBURGH, N. Y.—Extensive improvements are contemplated to the plant of the Newburgh Shipyards, Inc., which include the erection of a large power house, new office building, etc.

NEW YORK, N. Y.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 9, for furnishing electric traveling cranes in the structural shop at the navy yard, New York, N. Y. For further information relating to this specification (No. 2444) address the chief of Bureau of Yards and Docks, Navy Department, Washington, D. C.

NEW YORK, N. Y.—Bids will be received by the State Hospital Commission, Capitol, Albany, until July 12, for construction, heating, plumbing and drainage, and electric work for building and kitchen for disturbed patients (additional accommodations for disturbed patients) at the Manhattan State Hospital, Ward's Island. Plans may be seen at the hospital, Ward's Island; at the New York office of the Department of Architecture, Room 1224 Woolworth Building, and the Department of Architecure, Capitol, Albany. Lewis F. Pilcher is state architect.

OSWEGO, N. Y.—Upon the application of local taxpayers to restrain the city from building the proposed hydroelectric plant at Dam No. 6, Oswego River, public hearings are now being held at the local court. The proposed plant will have a capacity of about 1500 hp. and will cost about $139,000, and will be supplemented by a steam power plant, to cost about $300,000, for use during low-water periods.

OYSTER BAY, N. Y.—The New Telephone Company is planning to erect a two-story telephone exchange building on Tooker Avenue, to cost about $40,000.

POTSDAM, N. Y.—Plans have been completed by the Hannawa Falls Water Power Company for the construction of a hydroelectric power plant, to develop a minimum of 10,000 hp. F. A. Stoughton is president.

UTICA, N. Y.—The Utica Gas & Electric Company is now building a large hydroelectric development at Trenton Falls, where it is estimated that 30,000 hp. can be developed. Water power to operate the plant will be secured from West Canada Creek.

COLLINSWOOD, N. J.—The residents of West Collinswood are negotiating with the Public Service Electric Company for the installation of a local lighting system.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

FLEMINGTON, N. J.—The Dural Rubber Incorporation, 711 Broad Street, Trenton, recently incorporated with a capital stock of $200,000, has acquired property in Flemington, consisting of five acres of land and buildings for its proposed new plant for the manufacture of automobile tires, rubber goods for aeroplanes and aeroplane parts and specialties. The main building is 40 ft. by 200 ft.; the smaller buildings will be utilized for electric plant, boiler room and offices. Edgar H. Wilson is president.

GLOUCESTER, N. J.—Bids will be received by Harry P. Johnson, city clerk, until July 19 for lighting the streets of the city for a period of five years from Jan. 1, 1918. The installation of incandescent street lamps is under consideration.

NEWARK, N. J.—The Board of Education has approved an appropriation of $206,700 for the construction of a new vocational school for boys, on Sussex Avenue, near First Street. The proposed building will be of factory type, about 170 ft. by 225 ft., three stories, and will be equipped for instruction in toolmaking, foundry work, machine-shop operations, pattern making, woodworking, cabinet-making, machine construction, heat treatment of metals, gas and electric welding. There will also be departments for work in power-plant operation, automobile construction and repair, gas and gasoline-engine work. Plans have been prepared by Louis Sonntag, acting supervisory architect of the board. Wesley O'Leary, 31 Clinton Street, is one of the directors.

SOUTH AMBOY, N. J.—The City Council has granted the Jersey Central Traction Company of Keyport a franchise to construct and operate an electric railway in South Amboy. T. W. Wilson, 603 Market Street, Wilmington, Del., is general manager.

HARRISBURG, PA.—Preparations are being made by the Harrisburg Light & Power Company to begin work at once on the installation of the new street-lighting system. The present arc lamps will be replaced with lamps mounted on ornamental standards, maintained by underground wires.

PHILADELPHIA, PA.—The DeLong Hook & Eye Company is planning to build a power plant at its new factory to be erected at Twenty-first and Clearfield Streets. Plans are being prepared by William Steele & Son, architects, 1600 Arch Street, Philadelphia.

PHILADELPHIA, PA.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 16, under specification 2451, for installing coal-handling plant at the navy yard, Philadelphia, Pa. For further information address the chief of bureau.

TAMAQUA, PA.—The East Lehigh Colliery, recently rebuilt, it is reported, will be equipped for electrical operation throughout, at a cost of about $40,000.

WILMINGTON, DEL.—The contract for furnishing electricity for lighting the hundred bridges in Wilmington has been awarded to the Wilmington & Philadelphia Traction Company for a period of one year.

WILMINGTON, DEL.—The Delaware & Maryland Traction, Light & Power Securities Company has acquired the franchises of the Fox Creek Railroad Company of Dorchester County and the Peninsula Traction Company of Talbot County and proposes to build an electric railway to connect Cambridge with Bishop's Head on the Chesapeake Bay and a railway connecting the principal points on the Eastern Shore with Elkton. The company, it is said, also proposes to construct a road from Wilmington to Salisbury, with a branch from Bridgeville to Williamsburg and thence to Easton. Lindes & Company of Philadelphia, Pa., are interested.

BALTIMORE, MD.—Bids have been asked by the United Railways & Electric Company for stokers for the Pratt Street power house.

HUNTINGTON, W. VA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 23, for installing an elevator in the United States post office at Huntington, W. Va.

MORGANTOWN, W. VA.—The Morgantown & Wheeling Railway Company, it is reported, is contemplating the construction of 8 miles of new track.

WASHINGTON, D. C.—Bids will be received at the office of the secretary of Board of Commissioners of District of Columbia, Room 509, District Building, Washington, D. C., until July 9, for furnishing one 30-kw. motor-generator for the new Central High School Building at Thirteenth and Clifton Streets. Specifications, etc., may be obtained from the chief clerk of the Engineering Department, Room 427 District Building, upon deposit of $5.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 9, for 12 electric freight elevators as follows: Two in the new foundry at the navy yard, Norfolk, Va.; one in the new foundry at the navy yard, Philadelphia, Pa.; two in the new machine shop at the navy yard, Norfolk, Va.; one in the new structural shop at the navy yard, New York, N. Y.; two in the shipbuilding ways, navy yard, Norfolk, Va.; two in the shipbuilding ways, navy yard, Philadelphia, Pa.; two in the shipbuilding ways, navy yard, New York, N. Y., and one hydropneumatic elevator in the woodworking shop, navy yard, Pearl Harbor, Hawaii.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations as follows: Various, Schedule 1296, 86 dynamo and fire room clocks; Schedule 1303, miscellaneous brushes, boiler tube, spiral, bristle type; coil type; sectional; Schedule 1283, 48,800 steel wire casting brushes. Norfolk, Va., Schedule 1282, 500,000 4-amp. glass tube fuses; Schedule 1294, 7500 steel galvanized wire rope sockets; Schedule 1281, miscellaneous seamless steel tubing. Washington, D. C., Schedule 1300, 800,000 ft. Litzendraht wire; Schedule 1291, furnishing and installing three motor-generator sets. Puget Sound, Wash., Schedule 1301, one refrigerating plant; Schedule 1279, 10 water-tight, vibrating bells, 175 push buttons, 200 20-volt, salvo firing buzzers, 60 20-volt, non-water-tight buzzers, 1000 interior fittings, 1800 non-water-tight, portable guards, 2500 shade holders, 100 lb. grade "A-1," uncut clear mica, 4250 brass and bronze key sockets, 3000 screws for 5-amp. switch handles, 850 snap switches; Schedule 1302, one 3000-gal. fire and flushing pump. Newport, R. I., Schedule 1290, 7000 lb. seamless steel tubing. South Charleston, W. Va., Schedule 1288, one motor-driven trimming press. Boston and Brooklyn, Schedule 1303, 28 hydraulic turbine tube cleaners. Boston, Norfolk, Schedule 1303, miscellaneous single end boiler tube scrapers. Applications for proposal blanks should designate the schedule desired by number.

North Central States

NEW BALTIMORE, MICH.—The village of New Baltimore has voted to close down the municipal electric-light plant and to grant the Detroit (Mich.) Edison Company a franchise to furnish electrical service here. The municipal plant has been operated at a loss for several years.

CINCINNATI, OHIO.—The Union Gas & Electric Company has taken a five-year lease on property on Dana Avenue, Evanston, on which its proposes to erect a substation.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioners of purchases and supplies, City Hall, Cleveland, until July 10, for series multiple transformers. Specifications may be obtained on application to the office of the division of light and heat, Room 204, City Hall.

CLEVELAND, OHIO.—Bids will be received at the office of the commissioners of purchases and supplies, City Hall, Cleveland, until July 17, for constant-current regulators for the division of light and heat. Specifications may be obtained at the office of the division of light and heat, Room 204, City Hall.

SALEM, OHIO.—The Salem Lighting Company is installing a 3000-kw. steam turbo-generator to replace the old 600-kw., gas-engine-driven plant. H. E. Drevenstedt is general superintendent.

SEBRING, OHIO.—The Alliance (Ohio) Gas & Electric Company, it is reported, is negotiating for the purchase of the property of the McKee Light & Power Company of Sebring.

YOUNGSTOWN, OHIO.—The Youngstown & Niles Railroad Company has petitioned the Public Utilities Commission for permission to issue $37,500 in bonds. The company proposes to build a new electric railway between Youngstown and Niles, passing through the new town of McDonald.

BARBOURVILLE, KY.—The Barbourville Electric Light & Power Company is planning to acquire and operate its own coal mine to make sure of a continuous supply.

SELIERSBURG, IND.—The Silver Creek Telephone Company, recently organized with a capital stock of $60,000, is planning to erect telephone lines and exchanges. Walter B. McCannon is one of the directors.

EAST ST. LOUIS, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 23, for installing elevator in the United States post office at East St. Louis.

WENONA, ILL.—The contract for the new telephone exchange building in Wenona has been awarded to A. B. Kip & Company of Minonk. A new switchboard and other equipment will be installed.

CUBA CITY, WIS.—Bids will be received at the office of the village clerk, Cuba City, until July 12, for drilling a deep well and installing a new pump and motor. J. G. Thorne & Company, 317 Howes Block, Clinton, Iowa, are engineers.

MADISON, WIS.—The Peninsular Power Company has applied for an amendment of its charter increasing its capital stock from $1,750,000 to $3,000,000. The company has acquired a site on the Brule River, about 3 miles from Florence, where it proposes to build a hydroelectric power plant and furnish electricity over a large area in the northern part of the State. F. E. Tureaure of Madison is secretary.

RACINE, WIS.—Plans are being prepared for the construction of a tire and rubber factory, 260 ft. by 320 ft., five stories and basement, for the Racine Auto Tire Company, to cost, complete with equipment, about $300,000. The plans provide for a steam-driven generating plant.

ALBERT LEA, MINN.—The City Council has appointed a committee to investigate the proposal to establish a municipal electric-light plant in the city.

RANDOLPH, MINN.—Bids will be received by C. L. Morrill, clerk, addressed to the Consolidated School District No. 59 (Joint), Dakota County, Randolph, Minn., until July 18, for construction of consolidated school building, to be erected by the Consolidated School District No. 59, Dakota County, separate bids to be submitted as follows: (a) General contract; (b) plumbing; (c) electrical construction; (d) heating and ventilation; (e) temperature regulation; (f) fans, motor drives and heater. Plans and specifications may be obtained upon application to Tyrie & Chapman, architects, Auditorium Building Minneapolis.

RED WING, MINN.—Bids will be received by the State Board of Control, State Capitol Building, St. Paul, until July 17, for alterations and additions to power plant, and alterations to heating systems for the State Training School, Red Wing, in accordance with plans and specifications prepared by Charles L. Pillsbury & Co., engineers, St. Paul and Minneapolis.

COLLINS, IOWA.—The City Council has granted C. E. Lookingbill a franchise to install and operate an electric-light plant in Collins.

FREDERICKSBURG, IOWA.—At an election held recently the proposal to sell the local electric distributing system to C. Miller & Sons of Clermont, and grant them a 20-year franchise to furnish electric service in Fredericksburg was carried.

LYTTON, IOWA.—The Electric Light Company is contemplating extending its electric transmission lines on Walnut Street.

OTTUMWA, IOWA.—The Ottumwa Railway & Light Company is installing a new 1250-kw. turbo-generator set, a water softener, a settling basin and pumps will also be installed. The company will also erect a high-tension transmission line to Batavia.

PLYMOUTH, IOWA.—The Iowa Heat, Light & Power Company of Grinnell, it is reported, has purchased a site and will erect a power station to supply electricity in Plymouth.

SHENANDOAH, IOWA.—Bids will be received by the board of education of Shenandoah until July 19 for construction of Junior High School building, separate bids to be submitted on heating, plumbing, vacuum cleaning system, program clock, electric wiring, etc. The cost of the building is estimated at $100,000. Trunk & Gordon, 5 Donnell Court, St. Joseph, Mo., are architects.

SIOUX CITY, IOWA.—Plans are being prepared for the erection of an addition to the power station of the Sioux City Gas & Electric Company. The cost of the work is estimated at $200,000 and will include a building 75 ft. by 50 ft., and equipment.

TREYNOR, IOWA.—The construction of an electric railway from Noega to Treynor, using the old right of way of the Iowa & Omaha Short Line, is under consideration. Owing to the unsettled condition of the market for material no work will be done this year. E. A. Wickham of Council Bluffs is interested.

WAUCOMA, IOWA.—A special election will be held to submit the proposal of selling the property of the Waucoma Electric Light & Power Company to C. Miller & Sons, for $17,000.

CANTON, MO.—A special election will soon be held to vote on the proposal to issue $15,000 in bonds for extensions to water mains, building a seawall to protect power house, and to install an ornamental lighting system in Canton.

JOPLIN, MO.—At a special election held June 12 the proposals to build a new municipal electric-light plant, at a cost of $225,000, and to award the Empire District Electric Company a contract for lighting the city were defeated.

SEDALIA, MO.—Improvements are contemplated by the City Light & Traction Company to its electric plant on East Broadway. The work will cost about $60,000 and will include the erection of a 150-ft. smokestack, the installation of a new electric generating unit and a switchboard.

WASHBURN, N. D.—Bids will be received at the office of R. W. Brownson, city auditor, Washburn, until July 12, for furnishing and installing pumping equipment, piping and wiring connections for the city of Washburn. Plans and specifications may be seen at the above office, and at the Builders' Exchange in Minneapolis and St. Paul, Minn., and Fargo, N. D.

ALTOONA, KAN.—At an election held recently the proposal to issue $30,000 in bonds to enlarge the electric-light and water systems was carried.

ARMA, KAN.—The municipal electric plant, it is understood, will be closed down. Energy for operating the local system will be supplied by the Kansas Gas & Electric Company of Wichita.

GARDEN CITY, KAN.—Contracts have been awarded for extension to the waterworks system of Garden City, including electric transmission line and pumping plant. The Ruckel Engineering Company has charge of the engineering work.

Southern States

AMERICUS, GA.—Bonds to the amount of $250,000 and $100,000 in capital stock will be issued by the Americus Lighting Company, the proceeds to be used for the purchase of the property of the Americus Public Service Company and for extensions and improvements to the combined system.

ATLANTA, GA.—Bids will be received by the office of the superintendent of prisons, Department of Justice, Washington, D. C., until July 19, for furnishing at the United States penitentiary, Atlanta, Ga., material required for electric light, telephone and clock installations for the east and main cell wings of the above institution. Copies of specifications together with further information may be obtained upon application to the above office. F. H. Duehay is superintendent.

NASHVILLE, TENN.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 23, for installing an elevator in the United States post office at Nashville, Tenn.

ALBANY, ALA.—The Alabama Power Company of Birmingham, it is reported, contemplates improvements to its plants and transmission system, involving an expenditure of from $5,000 to $10,000.

OKLAHOMA CITY, OKLA.—The capital stock of the Oklahoma Gas & Electric Company has been increased from $5,000,000 to $50,000,000, the proceeds to be used for the construction of a large electric power plant and the erection of an extensive system of transmission lines. The company owns and operates light and power plants in Oklahoma City, Shawnee, Muskogee and several other towns in the State. H. M. Byllesby & Company of Chicago, Ill., are managers.

TEMPLE, OKLA.—At an election to be held July 13 the proposal to grant a franchise to John C. Keys of Lawton to construct and operate an electric light and natural gas plant will be submitted to the voters. Electricity is to be transmitted from the plant in Lawton.

WILSON, OKLA.—Bonds to the amount of $35,000 have been voted of which the proceeds of $10,000 will be used for the electric-lighting system and the remainder for waterworks. The Benham Engineering Company of Oklahoma City has charge of the engineering work.

Pacific and Mountain States

BREMERTON, WASH.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C.; until July 17 for furnishing non-watertight buzzers, salvo firing buzzers, push buttons, vibrating bells, electric fittings, interior fittings, snap switches, clear mica, non-watertight guards, shade holders, screws for switch handles and key sockets. For further information address the Bureau of Supplies and Accounts, Navy Department.

LA CONNER, WASH.—The La Conner Commercial Club has petitioned the Stone & Webster interests to extend its electric transmission lines into La Conner. The local power plant, owned by S. J. Eyerax, will be closed down permanently July 1.

TACOMA, WASH.—Preparations are being made for the construction of the large substation to be erected in Tacoma in connection with equipping the Cascade division of the Chicago, Milwaukee & St. Paul Railway for electrical operation. The Tacoma station will furnish energy for the Tacoma yards and for the division between this city and Seattle.

PORTLAND, ORE.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until July 30, for the installation of an elevator plant in the United States post office at Portland, Ore. For details see Searchlight Department.

ALAMEDA, CAL.—Work will soon begin on the installation of electrolier lighting system on Webster Avenue. The standards will carry three-lamp clusters, and will be maintained by underground wires.

BLYTHE, CAL.—The State Railroad Commission has issued an order authorizing the Southern Sierras Power Company of Denver, Col., to construct and operate an electric generating plant and distribution system in the city of Blythe. The company proposes to erect a steam generating station and an electric transmission line to connect with its hydroelectric plant. The cost of the steam plant is estimated at $20,000, of which $10,200 has been expended.

PITTSBURG, CAL.—The Board of Trustees is negotiating with the Pacific Gas & Electric Company of San Francisco for the installation of street lamps in the new residence district south of Eighth Street.

RICHFIELD, UTAH.—The State Public Utilities Commission has granted the Southern Utah Power Company permission for extensions to its plant and system, including the installation of a 100-hp. generator on Panguitch Creek and a distributing system for the town of Panguitch; a transmission line from Beaver Station to Marysvale and a line from Sevier to the latter town with a distribution system in Marysvale, and also a transmission line to the Dear Trail Mine to transmit 300 hp. Later the company will ask for a certificate of convenience and necessity to construct a 2500-hp. plant just below its present station near Beaver.

TUCSON, ARIZ.—The City Council has authorized the city clerk to advertise for bids for the installation of electric conduits on Sixth Avenue.

GREAT FALLS, MONT.—The City Council has adopted a resolution to create a special improvement district for the purpose of installing electric street lamps.

ALBUQUERQUE, N. M.—The Albuquerque Gas & Electric Company, recently incorporated, has acquired all the properties and holdings of the Albuquerque Gas, Electric Light & Power Company and the Albuquerque Electric Power Company and will continue the business carried on by the two companies in the city of Albuquerque.

Canada

ST. THOMAS, ONT.—The purchase of electrical equipment for the municipal electric-light plant is under consideration. E. H. Caughell is manager.

QUEBEC, QUE.—The construction of an electric and machine shop, to cost about $10,000, is contemplated by Louis Lavoie, 134 Queen Street, Quebec.

Miscellaneous

PEARL HARBOR, HAWAII.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until July 9, for furnishing, under specification 2449, elevators at the naval station at Pearl Harbor. For further information address the above bureau.

Directory of Electrical Associations

Printed in the First Issue of Each Month

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, J. P. Ross, Birmingham Railway, Light & Power Co.

AMERICAN ASSOCIATION OF ENGINEERS. Secretary, Arthur Kreisel, 29 South LaSalle St., Chicago, Ill.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, E. B. Burritt, 8 West 40th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa. Annual convention, Pittsburgh, Oct. 3-6.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS, INC. Secretary, F. A. Molitor, 35 Nassau St., New York City.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country.

AMERICAN PHYSICAL SOCIETY. Secretary, Prof. A. D. Cole, Ohio State University, Columbus, Ohio.

AMERICAN SOCIETY OF TESTING MATERIALS. Secretary-treasurer, Edgar Marburg, University of Pennsylvania, Philadelphia.

ARKANSAS ASSOCIATION OF PUBLIC UTILITY OPERATORS. Secretary-treasurer, Roy B. Fowles, Pine Bluff, Ark.

ASSOCIATED MANUFACTURERS OF ELECTRICAL SUPPLIES. General secretary, C. E. Dustin, 30 East 42d St., New York.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, George C. Holberton, San Francisco, Cal.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, John F. Kelly, McKeesport, Pa. Annual convention, Philadelphia, Sept. 10-14.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Joseph A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, W. L. Connelly, Gibson, Ind.

BRITISH COLUMBIA ASSOCIATION OF ELECTRICAL CONTRACTORS AND DEALERS. Secretary-treasurer, E. Brettell, Electric Supply Company, Ltd., Vancouver, B. C.

CALIFORNIA ASSOCIATION OF CONTRACTORS AND DEALERS. Secretary, James W. Redpath, 505 Rialto Bldg., San Francisco, Cal.

CANADIAN ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary-treasurer, Alan Sullivan, Excelsior Life Building, Toronto, Can.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary-treasurer, T. F. Kennedy, 900 15th St., Denver, Col.

COMMERCIAL SECTION N. E. L. A. Secretary, F. D. Beardslee, Union Electric Light & Power Company, St. Louis, Mo.

EASTERN NEW YORK SECTION, N. E. L. A. Assistant secretary, J. L. Hemphill, General Electric Company, Schenectady, N. Y.

ELECTRICAL CONTRACTORS' ASSOCIATION OF CONNECTICUT. Secretary, George M. Chapman, Waterbury, Conn.

ELECTRICAL CONTRACTORS' ASSOCIATION OF MASSACHUSETTS. Secretary, H. D. Temple, 30 Foster St., Worcester, Mass.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, A. J. Burns, 318 West Tenth St., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF THE STATE OF PENNSYLVANIA. Secretary, M. G. Sellers, 1518 Sansom St., Philadelphia.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, J. C. Staff, 578 Jackson St., Milwaukee, Wis.

ELECTRICAL DEALERS AND CONTRACTORS' ASSOCIATION OF ONTARIO. Secretary, E. A. Drury, 45 Murray St., Toronto, Can.

ELECTRICAL MANUFACTURERS' CLUB. Secretary, H. B. Crouse, Crouse-Hinds Co., Syracuse, N. Y.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. General secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliott, 34 Ellis St., San Francisco, Cal.

ELECTRIC POWER CLUB. Secretary, C. H. Roth, 1410 West Adams St., Chicago.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Affiliated with the N. E. L. A. Secretary, A. Jackson Marshall, 29 West 39th St., New York.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, 29 West 39th St., New York.

FLORIDA ENGINEERING SOCIETY. Secretary, J. R. Benton, Gainesville, Fla.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, L. W. Marrow, Norman, Okla.

GEORGIA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, Dan Carey, Atlanta Builders' Exchange, Atlanta, Ga.

ILLINOIS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, L. B. Van Nuys, Central Electric Co., Peoria, Ill.

ILLINOIS STATE ELECTRIC ASSOCIATION. Secretary, R. H. Abbott, Petersburg, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, Clarence L. Law. Sections in New York, Philadelphia, Pittsburgh, Cleveland, Chicago and Boston.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary, Thomas Donahue, Lafayette, Ind.

INDIANA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, George Skillman, Indianapolis, Ind.

INDUSTRIAL ELECTRIC HEATING ASSOCIATION. Secretary, Homer Kunz, Toledo Railways & Light Co., Toledo, Ohio.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th St., New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, David Sarnoff, 111 Broadway, New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England.

IOWA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, M. T. Humphrey, Waterloo, Iowa.

IOWA SECTION, N. E. L. A. Secretary-treasurer, L. E. Caldwell, Iowa City, Iowa.

JOVIAN ORDER. Jupiter (president), Henry L. Doherty, New York City; Mercury (secretary), E. C. Bennett, Syndicate Trust Building, St. Louis, Mo. Annual convention, October.

KANSAS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, J. A. Mercer, 108 West Eighth Ave., Topeka, Kan.

KANSAS PUBLIC SERVICE ASSOCIATION. Secretary-treasurer, W. W. Austin, Cottonwood Falls, Kan.

KENTUCKY ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, Herbert E. Ottenheimer, Louisville, Ky.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, I. G. Marks, 323 Chartres Street, New Orleans, La.

MAINE ELECTRIC ASSOCIATION. Secretary-treasurer, Walter S. Wyman, Augusta, Me.

MICHIGAN SECTION, N. E. L. A. Secretary, Herbert Silvester, Detroit Edison Co., Monroe, Mich.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary, H. E. Young, Minneapolis General Electric Company, Minneapolis, Minn.

MINNESOTA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, G. M. Jones, 14 Seventh St., N. Minneapolis, Minn.

MISSISSIPPI ELECTRIC ASSOCIATION. Affiliated with the N. E. L. A. Secretary-treasurer, W. F. Wheeler, Hattiesburg, Miss.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES. Secretary-treasurer, F. D. Beardslee, Union Electric Light & Power Co., St. Louis.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, William L. Smith, Concord, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, 33 West 39th St., New York.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, H. C. Brown, 41 Martin Building, Utica, N. Y. Next meeting, New Orleans, October, 1917.

NATIONAL ELECTRICAL CREDIT ASSOCIATION. Secretary, Frederic P. Vose, 1343 Marquette Bldg., Chicago, Ill.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary of electrical committee, Ralph Sweetland, 141 Milk St., Boston, Mass.

NEBRASKA SECTION, N. E. L. A. Secretary-treasurer, B. E. Egan, Room 201, Union Pacific Building, Omaha, Neb.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 15 State St., Boston, Mass.

NEW ENGLAND SECTION, N. E. L. A. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NEW MEXICO ELECTRICAL ASSOCIATION. Secretary-treasurer, E. A. Thiele, Roswell, N. M.

NEW YORK ELECTRICAL CREDIT ASSOCIATION. Secretary, Franz Neilson, 120 Broadway, New York.

NEW YORK ELECTRICAL SOCIETY. Secretary, George H. Guy, 29 West 39th St., New York.

NORTHWEST SECTION, N. E. L. A. Secretary, J. F. Farquhar, Washington Water Power Company, Spokane, Wash.

NORTHERN WHITE CEDAR ASSOCIATION. Secretary, R. N. Boucher, 743 Lumber Exchange, Minneapolis, Minn.

OHIO ELECTRIC LIGHT ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio.

OHIO SOCIETY OF MECHANICAL, ELECTRICAL AND STEAM ENGINEERS. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus.

OREGON ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary-treasurer, J. W. Oberender, 502 Dekum Building, Portland, Ore.

PACIFIC COAST SECTION, N. E. L. A. Secretary, A. H. Halloran, Crossley Bldg., San Francisco, Cal.

PENNSYLVANIA ELECTRIC ASSOCIATION, State Section N. E. L. A. Secretary, H. M. Stine, 211 Locust St., Harrisburg, Pa.

PUBLIC SERVICE ASSOCIATION OF VIRGINIA. Secretary, W. J. Kehl, Virginia Railway & Power Co., Richmond, Va.

PUBLIC UTILITIES ASSOCIATION OF WEST VIRGINIA. Secretary, W. C. Davisson, West Virginia Water & Electric Co., Charleston, W. Va.

RADIO CLUB OF AMERICA. Secretary, Thomas J. Styles, 152 Beech St., Yonkers, N. Y.

ROCKY MOUNTAIN ASSOCIATION OF MUNICIPAL ELECTRICIANS. President, Lawrence Stone, Denver, Col.

SOCIETY FOR ELECTRICAL DEVELOPMENT, INC. General manager, J. M. Wakeman, 29 West 39th St., New York.

SOCIETY FOR THE PROMOTION OF ENGINEERING EDUCATION. Secretary, Dean F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

SOUTH DAKOTA ELECTRIC POWER ASSOCIATION. Secretary, A. H. Savage, 1114 Pioneer Building, St. Paul, Minn.

SOUTHEASTERN SECTION, N. E. L. A. Secretary-treasurer, Thomas E. Peters, Columbus, Ga.

SOUTHERN CALIFORNIA ELECTRICAL CONTRACTORS AND DEALERS' ASSOCIATION. Secretary, H. C. Bower, 602 Metropolitan Bldg., Los Angeles, Cal.

SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION. Secretary, H. S. Cooper, 403-4 Slaughter Bldg., Dallas, Tex.

SOUTHWESTERN SOCIETY OF ENGINEERS. Secretary, Forrest E. Baker, 721 First National Bank Building, El Paso, Tex.

TEXAS STATE ASSOCIATION OF ELECTRICAL CONTRACTORS. Secretary, J. H. Ashley, Fort Worth, Tex.

TRI-STATE WATER AND LIGHT ASSOCIATION. Secretary-treasurer, W. P. Steiglitz, Columbia, S. C.

VERMONT ELECTRICAL ASSOCIATION. Secretary-treasurer, C. H. West, Rutland, Vt.

VIRGINIA STATE ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, E. M. Andrews, Richmond.

WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, E. N. Layfield, 1735 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

1,230,835. TELEPHONE-EXCHANGE SYSTEM; Garrison Babcock, Chicago, Ill. App. filed Aug. 8, 1913. Relates to service meters for telephone-exchange systems, particularly those where the metering mechanism is installed at the substations.

1,230,840. MEANS FOR FACILITATING STARTING OF GAS ENGINES; Charles H. Belknap, Brooklyn, N. Y. App. filed March 10, 1916. Facilitates starting of gas engines and particularly the explosion motors used on automobiles, especially in cold weather.

1,230,848. ELECTRIC LIGHT SOCKET; Tonjes A. C. Both, Stratford, Conn. App. filed Feb. 20, 1915. Provides a quick make and a quick break of the electric current without arcing.

1,230,857. ELECTROMAGNETIC VIBRATOR; Frank E. Brixius, Manitowoc, Wis. App. filed Oct. 21, 1916. Means for vibrating pattern plates disposed in molds.

1,230,869. METHOD OF MAKING INCANDESCENT LAMPS; William D. Collidge, Schenectady, N. Y. App. filed Nov. 7, 1910. Consists in winding the tungsten filament on a spider while it is in a heated and pliant condition.

1,230,874. METALLIC AUDION; Lee de Forest, New York, N. Y. App. filed Feb. 21, 1917. Provides an audion with a metal shell which forms one electrode of the device.

1,230,884. TELEPHONIC APPARATUS; Charles Forgues, Paris, France. App. filed Aug. 3, 1914. Relates to an intensive and hygienic telephonic apparatus of the "net" type.

1,230,934. ALTERNATING-CURRENT ELECTROMAGNETIC CONTROL SWITCH; John T. Skinner, Lawrence, Kan. App. filed Jan. 28, 1915. Relates to electromagnetic switches, particularly to those used in conjunction with an alternating current.

1,230,935. ELECTRIC BRAKING SYSTEM; John T. Skinner, Lawrence, Kan. App. filed May 17, 1915. Relates to a system of electro-dynamic control for motor-propelled vehicles.

1,230,946. PORTABLE SWITCHBOARD; George Thompson, Shelby, Ohio. App. filed Dec. 6, 1915. Produces a simple and compact switchboard whereby, by plugging in at different points a wide range of circuit connections may be obtained.

1,230,955. MAXIMUM CUT-OUT; Gerardus J. van Swaay, Delet, and Henri I. Keus, Hengelo, Netherlands. App. filed March 8, 1915. Relates to switches which may be switched in and out by hand and which are further thrown out automatically on the current exceeding a predetermined value.

1,230,956. MICROPHONE; Alexandre Vaugean, Anthony de Lavandeyra and William Garthwaite, Paris, France. App. filed Oct. 15, 1915. Relates to microphones for use in telephony.

1,230,957. ELECTRIC SIGNALING DEVICE FOR AUTOMOBILES; George F. Voight, San Francisco, Cal. App. filed June 21, 1916. Provides means whereby the driver of an automobile can operate an electrically actuatable horn or signaling device by manipulating a switch element within the steering-wheel assembly.

1,230,983. ELECTRIC PULL SOCKET; Frederic Barr, New York, N. Y. App. filed Oct. 31, 1911. Relates particularly to the construction by means of which the parts of a switch are supported in the casing and the operating chain or cord is guided.

1,230,996. TELEPHONE SYSTEM; Edward E. Clement, Washington, D. C. App. filed March 2, 1911. Relates particularly to semi-automatic systems.

1,231,008. ELECTRICAL INSTALLATION; Frank W. Funk, Youngstown, Ohio. App. filed Aug. 24, 1916. Provides a telltale which shall give visible or audible signal in the event of an excess of potential.

1,231,013. AUTOMATIC TELEPHONE-EXCHANGE SYSTEM; Charles L. Goodrum, New York, N. Y. App. filed Nov. 18, 1914. Relates to systems employing machine switching.

1,231,024. TELEPHONE-EXCHANGE SYSTEM; Edward E. Hinrichsen, New York, N. Y. App. filed May 19, 1915. Provides a simple equipment for obtaining a flashing signal.

1,231,033. ELEVATOR SIGNALING SYSTEM; Walter A. Loomis, Los Angeles, Cal. App. filed Feb. 7, 1916. Provides a signaling means which will indicate to operators of elevator cars their relative running positions at all times.

1,231,036. REFILLABLE CARTRIDGE FUSE; Clarence T. McDonald, Chicago, Ill. App. filed Dec. 31, 1913. Relates to inclosed or cartridge fuses of the refillable type.

Record of Electrical Patents

Notes on United States Patents issued on June 26, 1917

1,231,043. IGNITION SYSTEM; Charles T. Mason, Sumter, S. C. App. filed Oct. 21, 1916. Relates to an ignition system for a high-tension, high-speed magneto.

1,231,048. ELECTRICAL RELAY; Egron O. Moller, Brooklands, England. App. filed March 20, 1913. Relates to automatic circuit breakers.

1,231,056. ELECTRIC IRON; Charles S. Palmer and Dean Palmer, Saranac Lake, N. Y. App. filed Dec. 18, 1916. Provides improved automatic means for controlling the supply of current.

1,231,057. DRY-CELL BATTERY; Herbert R. Palmer, Cleveland, Ohio. App. filed March 2, 1917. Relates to the construction of dry-cell batteries or batteries of the Leclanché type.

1,231,063. ELECTRICAL RECEPTACLE; Clarence D. Platt, Bridgeport, Conn. App. filed Feb. 15, 1917. Provides a receptacle in which it is impossible to accidentally short-circuit the screw socket and the center contact.

1,231,085. TELEPHONE-EXCHANGE SYSTEM; Arthur B. Sperry, New York, N. Y. App. filed Sept. 22, 1916. Relates to systems employing machine switching.

1,231,086. TELEPHONE-EXCHANGE SYSTEM; Arthur B. Sperry, New York, N. Y. App. filed Nov. 6, 1916. Relates to systems employing machine switching.

1,231,095. TELEPHONE TRANSMITTER; Naho Tannaka, New York, N. Y. App. filed Nov. 11, 1915. Relates to improvements in variable resistance devices, particularly to telephone transmitting apparatus.

1,231,109. AUTOMATIC SYNCHRONIZER; James G. Zimmerman, Milwaukee, Wis. App. filed Nov. 28, 1913. Relates generally to systems of electrical distribution wherein alternating, intermittent or pulsating currents are utilized.

1,231,126. GENERATOR FOR INTERMITTENT ELECTRIC CURRENTS; Jonas Carter, Waukegan, Ill. App. filed March 1, 1916. Produces a device for use particularly with internal-combustion engines.

1,231,140. TELEGRAPH SYSTEM; Amos F. Dixon, Newark, N. J. App. filed April 15, 1915. Provides for automatically signaling the receipt of operative current impulses at any printer.

1,231,149. IGNITION MECHANISM FOR INTERNAL-COMBUSTION ENGINES; Harry F. Geist, Racine, Wis. App. filed Sept. 20, 1915. Capable of being economically manufactured.

1,231,179. SIGNALING DEVICE; James P. McBride, Seattle, Wash. App. filed Feb. 24, 1914. Relates to signaling devices which are especially adapted for use in the logging industry.

1,231,193. ELECTROMAGNET; Charles C. Powers, Williams, Ariz. App. filed Sept. 8, 1916. Provides means whereby a rotatable movable core (either in one piece or in a number of separate sections) may be employed in place of the conventional rectilinearly movable core.

1,231,196. RADIANT-TYPE STOVE; William A. Rankin and Henry D. Laraway, Ontario, Cal. App. filed Feb. 2, 1916. Provides a water-cooling means for preventing the oxidation and dulling of the reflector and the surrounding case.

1,231,200. ELECTRICAL TIMING DEVICE; Earl H. Rollinson, Lyons Farms, N. J. App. filed Nov. 27, 1915. Provides a means so that none of the operating current passes through the hot wire; it depends entirely for its operation upon heat generated in a heating coil which is placed either in a main circuit or a shunted circuit through the device.

1,231,202. INSULATING JOINT; Frank D. Saylor, Pittsburgh, Pa. App. filed Sept. 9, 1914. Provides a fixture for supporting either electric or gas lamps or both.

1,231,221. ELECTRIC-CURRENT INTERRUPTER; Knut Trosdahl, Christiania, Norway. App. filed May 9, 1917. Has for its object an electric current limiter of the periodical interruption type.

1,231,229. MOTOR-STARTING SWITCH; Carl A. Ahlstrom, New Britain, Conn. App. filed April 20, 1916. Prevents the operator from starting the motor with the fuses in circuit.

1,231,264. IGNITION DEVICE; Charles F. Kettering, Dayton, Ohio. App. filed March 12, 1916. Relates to an ignition system or combination of apparatus for internal-combustion engines of automobiles and other vehicles.

1,231,265. CONTROL FOR ELECTRICAL SYSTEM; Charles F. Kettering, Dayton, Ohio. App. filed Aug. 9, 1912. Improves electric voltage regulators.

1,231,266. ENGINE-STARTING DEVICE; Charles F. Kettering, Dayton, Ohio. App. filed March 5, 1915. Facilitates the starting of engines of the non-self-starting type, etc.

1,231,268. CIRCUIT CONTROLLER; George C. Knaff, Chicago, Ill. App. filed Oct. 29, 1914. Relates to sockets or connectors for controlling the light of one or more incandescent lamps.

1,231,271. ELECTROMAGNETIC SWITCH; Franz Krantz, Stuttgart, Germany. App. filed Dec. 17, 1914. Provides an intimate engagement of low electrical resistance between the contacts upon establishing the circuit and exerts uniform pressure on the two poles.

1,231,273. INSULATING CAP FOR CONDUITS; Charles M. Lefkowitz, New York, N. Y. App. filed June 24, 1916. Comprises a perforated insulating cap having a recess to receive an end of the conduit, armored conductor or the like.

1,231,319. AUTOMATIC TELEPHONE SYSTEM; Charles S. Winston, Chicago, Ill. App. filed Sept. 17, 1913. Relates to improved means for reversing the battery flow over a calling telephone line upon response being received from a called substation.

1,231,335. ELECTRIC INCANDESCENT LAMP; John H. Dale, New York, N. Y. App. filed March 5, 1915. Relates to electric incandescent lamps and especially to the "nitrogen" lamp.

1,231,364. INCLOSED SAFETY FUSE; Henry M. Huxley, Evanston, Ill. App filed May 3, 1915. Relates to cartridge fuses for the protection of electrical circuits, and particularly the "knife-blade" type.

1,231,367. ELECTRIC SWITCH; Ernest H. Jacobs, Schenectady, N. Y. App. filed May 23, 1914. Relates to the mechanism for actuating electric switches.

1,231,379. SWIVEL ATTACHMENT PLUG; Otto Kessler, Passaic, N. J. App. filed July 27, 1916. Permits freedom of swiveling movement with maintenance of perfect electric contact between the elements.

1,231,412. ELECTROMAGNETIC SWITCH; Edwin J. Murphy, Schenectady, N. Y. App. filed July 13, 1914. Provides a device in which the contacts cannot stick or freeze together and at the same time are spring-pressed apart.

1,231,416. MANUFACTURE OF INCANDESCENT LAMPS; Harry H. Needham, East Orange, N. J. App. filed Jan. 19, 1916. Provides a method by which a substance in the bulb can be protected from the effects of variations of pressure and temperature of the bulb contents.

1,231,417. ATTACHMENT-PLUG RECEPTACLE; Arvid H. Nero, New Britain, Conn. App. filed March 22, 1917. Relates particularly to the contacts.

1,231,456. ELECTRIC-LAMP SOCKET; George B. Thomas, Bridgeport, Conn. App. filed Jan. 20, 1916. Provides an improved holding device and receiving contacts for lamps of the Edi-Swan type.

1,231,489. SPARK GAP; Charles E. Campbell, Lynn, Mass. App. filed April 24, 1916. Improvements.

1,231,494. NEON TUBE; Georges Claude, Boulogne-sur-Seine, France. App. filed June 16, 1915. Overcomes a defect in neon tubes, owing to the excessive amount of red contained therein when employed for lighting purposes.

1,231,516. PHANTOM LOADING COIL; William Fondiller, New York, N. Y. App. filed May 1, 1916. Relates to phantom circuit loading in telephony.

1,231,528. GENERATOR FOR HIGH-FREQUENCY CURRENTS; Peder O. Pedersen, Frederiksburg, Denmark. App. filed March 24, 1913. Provides a generator with which frequencies higher than those previously obtained can be procured.

1,231,537. CALL SYSTEM; Thomas J. Murphy and Edward Miller, Rochester, N. Y. App. filed July 17, 1916. Indicates upon calling whether the party called is in position to receive the call.